



SETR Process Handbook

Version 1.0

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Systems Engineering Development and Implementation Center (SEDIC)

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1. Purpose

1.1 General

This Systems Engineering Technical Review (SETR) Process Handbook is provided to facilitate the implementation of NAVAIRINST 4355.19E, and is intended to be used in conjunction with the associated SETR Checklists at corresponding SETR event(s) and/or audits. General information regarding SETR events, audits, and SETR conduct is provided below. Because every program has its unique aspects, the framework described in this handbook may be tailored to ensure that the technical maturity of the system under review is properly examined during the acquisition process. Administrative actions, conduct, and procedures for capturing Requests for Action (RFA)/Request for Information (RFI) are also described below.

1.2 Background

1.2.1 SETR Purpose

The SETR process provides a rigorous and structured means of evaluating the progress of the technical development portion of system acquisition. SETR reviews enable independent assessments throughout the program's life cycle of engineering technical review categories such as:

- System Requirements, Traceability and Design;
- Test, Evaluation, and Certification of Product; and
- Project Management and Execution (Planning, Assessment and Control, including Logistics, Training and Sustainment)

SETR events and audits are independent reviews that are conducted by a Technical Review Board (TRB) comprised of senior technical and programmatic Subject Matter Experts (SME)/Technical Area Experts (TAE) from competencies relevant to the particular program who evaluate the overall development, design maturity, and associated risk(s), against established maturity baselines.

SETR reviews are meant to assess program technical status, not to uncover new information or issues. Active collaboration with competency SMEs throughout the system's development is expected to bring all technical and programmatic issues to light on an ongoing basis. Technical reviews of program maturity should be event-driven and conducted when the system under development meets the tailored review entrance criteria, as documented in the program's Systems Engineering Plan (SEP) and as assessed by the respective SETR Checklist. The "go/no-go" decision regarding whether to conduct the SETR review ultimately resides with the TRB Chair. The Systems Engineer (SE) is responsible for establishing and maintaining effective and open technical communication to assist the TRB Chair in making informed decisions.

1.2.2 SETR Process

As a program progresses, the system development (including new subsystems and/or system modifications) is subject to a series of reviews of increasing detail. These reviews are structured to provide the basis for incremental approval of the technical baseline, while evaluating the baseline maturity level required in the next stage of development. This process provides Program Managers (PM) with a sound analytical basis, including an independent assessment and/or status of developmental risk, for the system's continued acquisition, confidence of satisfactory Initial Operational Test and Evaluation (IOT&E) performance, and ultimately, the successful fielding of an effective and suitable system for the Warfighter.

1.2.3 SETR Outcome

Each review should highlight the program's design and development process, and demonstrate and confirm completion of required accomplishments as defined by the program SEP. Reviews also:

- Accomplish predictive analysis to assess future technical and resource risk(s) associated with continued development.
- Identify entry criteria for an overall readiness and technical maturity assessment evaluation.
- Support risk identification and evaluation for the next phase of the engineering process or to the next key milestone when the event is successfully executed.

End products of these SETR events and audits include:

- Capability assessment
- Technical baseline assessment
- Independent review of risk assessments and mitigation options
- The basis for an independent Naval Air Systems Command (NAVAIR) cost estimate
- Action items captured in RFA forms
- Complete documentation of all issues raised during the event
- Event minutes

The SETR process depends on rigorous engineering analysis supported by objective documentation and process plans. These documents are inherently part of the engineering process and are required to identify the maturation of a configuration-managed design and archive design decisions.

2. Resources

2.1 Integrated Systems Engineering Environments

The Systems Engineering Development and Implementation Center (SEDIC) is developing an Integrated Systems Engineering Environment (ISEE). The purpose of the ISEE is to bring together multiple Systems Engineering tools in a single integrated environment to facilitate a more collaborative and accurate workflow between systems engineering functions (e.g., requirements management, risk management, and Checklist management). The SETR Checklist Manager is the first tool being introduced into this environment.

2.2 Web Site

The SETR Checklists are managed using the SETR Manager application hosted on the Navy Systems Engineering Resource Center (NSERC) Web site. Refer to the NSERC link and the Web site screen shot shown in Figure 1 below:

<https://nserc.nswc.navy.mil/navair/NAVAIRSE/SitePages/Home.aspx>



Figure 1. NSERC Web Site

Additional reference information can also be found at the NSERC Web site such as:

- Updated Checklist user instructions, roles, responsibilities, and training (embedded in the SETR Manager Tailoring guide)
- Suggested SETR contract language
- A list of designated competency reviewer Points of Contact (POC)
- Links to SE guidance and instructions

The NSERC NAVAIR Systems Engineering page also provides the conduit for the SEDIC to promulgate lessons learned in an effort to improve systems engineering best practices. The data archived in the SETR Manager Checklist Library embedded in the SETR Manager application will be used by SEDIC as a reference in the evolutionary improvement of the guidance and tools aiding SETR execution.

2.3 Repository

The SEDIC will review the results of SETR events across all programs to assist in identifying trends to develop lessons learned and best practices, and to continually improve the checklist tools, reference files, and question content. In order to accomplish this effort, the SEDIC maintains a repository of SETR event results. Upon completion of a SETR event, the SETR Manager retains the SETR Checklist by default and the SE should send all final briefs used during the SETR event, including any updates in response to RFAs, to AIR-4.1 SEDIC (SEDIC@navy.mil). Contact the SEDIC prior to exchanging any information that is constrained by proprietary requirements.

2.4 Checklists

The primary steps in the use of SETR Checklists are:

Step 1. Tailor – Implementing the program-unique tailoring of the checklist in agreement with the SEP. A program SEP and corresponding contractor Systems Engineering Management Plan (SEMP) defines the roles and responsibilities involved in conducting technical reviews. The SEP will include the initial tailoring of the SETR process and entrance criteria for the program. When delivered with the Request for Proposal (RFP), the SEP will become the foundation of the contractors SEMP.

Step 2. Review – Ensuring appropriate reviewers provide and document their scoring assessment. The SE is responsible for compliance with the program SEP and ensuring the tailored completion of each SETR Checklist. To tailor the checklist in an efficient manner, the SE should make reasonable effort to coordinate tailoring decisions with a representative of each competency. The TRB Chair shall approve the checklist tailoring prior to a SETR event. One-on-one briefing of the TRB Chair is the most efficient method to obtain concurrence.

Step 3. Adjudicate and Evaluate – The SE leads the effort of evaluating the technical maturity through scoring the tailored checklist questions and adjudicates any differences of opinion amongst SMEs. Once completed, the SE evaluates the overall results of the assessment to ensure that the entry criteria have been met.

3. SETR Fundamentals

3.1 Administrative

3.1.1 Alignment and Timing

The SETR process should align with the program Acquisition Strategy (AS) at Milestone (MS) A and MS B as established by the following:

- PM
- SEs, including:
 - Chief Engineer for Acquisition Category (ACAT) I or Major Defense Acquisition Program (MDAP)
 - Program Manager, Air (PMA) Assistant Program Manager for Engineering (APME)
 - AIR 4.1.1 Assistant Program Manager for Systems Engineering (APMSE) for ACAT II and below programs
 - Non-AIR 4.1.1 Lead SEs for ACAT II and below programs
 - Assistant Program Manager for Logistics (APML), and
 - Assistant Program Manager for Test and Evaluation [APM(T&E)]

Additionally, the SETR process should also be aligned with:

- Program plans,
- Specifications,
- Statement of Work (SOW), and
- Contract Data Requirements Lists (CDRL)

Details of this alignment should be included in the program SEP and reflected in the contractors' SEMP. CDRLs and other deliverables should be provided early to allow adequate time for Government review and/or corrective action prior to the applicable SETR event.

The role of systems engineering cannot be overstated. The SETR process enables SEs to apply the necessary rigor to demonstrate technical maturity to the TRB. This process also aids the PM in decision-making by highlighting any areas of lesser maturity along with the associated risks. SEs, with APM(T&E) and APML assistance, should support the PMA with the following actions:

- Ensure that program engineering plans include the conduct of SETR events and audits. This planning should be coordinated with:
 - PMs
 - Assistant Program Executive Officer for Logistics (APEO(L))
 - Assistant Program Executive Officer for Test and Evaluation (APEO(T&E))
 - Assistant Program Executive Officer for Engineering (APEO(E))

- All required technical reviews and audits must be identified in the SOW to ensure contractor compliance, including any incremental technical reviews/audits in which the Government requires participation/insight.
- Ensure that the program contract(s) includes provisions for such identified SETR events (e.g., SOW, CDRLs, Specifications), and the required documentation and data to support each Technical Review.
- Program contracts must also include requirement clauses that all RFAs identified during each SETR event be formally “closed” for satisfactory completion and that schedules be updated to account for any related work.

A well planned and executed program should clearly define the critical path leading to each SETR event in the Integrated Master Schedule (IMS). Entrance criteria, documents, Government document review, and analytic artifacts required to conduct the review should be contained in a properly constructed, task-oriented schedule. Completing all entrance criteria with 100% compliance is not mandatory to conduct a SETR event. However, the risks associated with less than 100% must be identified, understood, and acceptable to the PM and TRB Chair. Key SETR preparations are summarized in Table 1, Section 3.1.3.

When establishing the Earned Value Management approach for the program, consideration should be given to including the technical management tasks that lead to each SETR event. When completed properly, readiness for the review will be self-evident from EV and IMS metric tracking.

SETR events and audits are scheduled when the required technical baseline is projected to meet the entrance criteria for the intended review. As the program moves through the SETR timeline, the prime contractor should conduct SETR-like reviews of their subcontractors prior to each system-level SETR event. These subsystem reviews should assess the work being performed by the subcontractors. The system-level review should encompass the lower-level technical content of these subsystem reviews, including any actions resulting from the lower-level reviews, in order to demonstrate proper integration into the system-level design.

Prior to each review, the IPT provides the required documents to Government technical experts for review and analysis. When feasible, the reviewers should provide feedback to the IPT for corrective action prior to the review. The correctness and completeness of this information should be measured against clearly stated objective standards (as contained in the checklists and other guidance). When necessary, the program may develop amplifying guidance for assessing documentation content/maturity with input from the appropriate competency SMEs.

If SETR reviews support an Engineering Change Proposal (ECP) or subsystem modification to a larger weapon system already fielded, then the SETR reviews must also assess the insertion of new requirements and integration of design changes into the fielded system’s baselines.

3.1.2 Participants

Each SETR event is conducted under the cognizance of a TRB, which is led by a TRB Chair. The program's SE supports the Board and is responsible for the coordination and conduct of the SETR event. The SE should maintain communication with the TRB Chair between SETR events for guidance. The remainder of the board should consist of technical representation by senior-level leaders from the technical competencies and supported by technical SMEs. Board selections should be made by the Competency POCs as requested by the TRB Chair and coordinated with the associated APEO(E). The Board conducts a thorough, independent review of the material presented for the SETR event to substantiate the technical status and maturity of the system development presented by the Integrated Product Team (IPT). Every reasonable effort should be made to maintain consistency of individuals assigned to the TRB through the development effort.

The roles and responsibilities of the TRB are as follows:

- **TRB Chair** – The TRB Chair is independent of the program team. In coordination with the APEO(E), the SE should request a TRB Chair to be appointed by AIR-4.1 at least 90 days before the review. The timing of this request may vary depending on ACAT level and the complexity of the program. For software-only SETR reviews, AIR-4.1 may approve the appointment of the TRB Chair from the NAVAIR Software (AIR-4.9) organization. The role of the Chair includes:
 - Ultimate determination of TRB membership
 - Approval of the final review artifacts and agenda
 - Approval of the checklist tailoring
 - Oversight of the SETR event and RFA process
 - Issuing of the Technical Review Summary Report
- **Systems Engineer**
 - Ensure that the competency's SMEs provide supporting data and participation in the required review
 - Develop, coordinate, and execute, in cooperation with the competency's SMEs, individual review preparations
 - Ensure that the preparation of review material is coordinated across IPT and competencies, including the completion of the applicable SETR Checklist
 - Arrange for a pre-briefing of the TRB Members and Chair, as applicable
 - Conduct the review for the TRB
 - Organize and supervise the documentation of RFAs in support of the TRB Chair

These responsibilities may be shared with the software lead engineer for the Software Specification Review (SSR), Integration Readiness Review (IRR) and other software intensive reviews

- **TRB Members** – It is the responsibility of the TRB members to understand the technical status and acquisition strategy as it affects the development of the program based on their review of the SETR event material presented, and their knowledge of the program prior to the review. TRB members should:
 - Prior to the review, request a pre-brief (if necessary) to understand the technical status and acquisition strategy and Identify known questions/issues to the SE
 - At the review, document technical concerns, assist the TRB Chair with an accurate assessment of the impact of the technical concerns, and assist the TRB Chair in determining if the project is ready to proceed into the next phase of system acquisition development with manageable risk
- **Recorder**
 - Collate RFAs for submission to the TRB
 - Assist in preparing the Technical Review Report for distribution by the Chair
 - The Recorder has no technical responsibilities in the SETR event
- **Other Participants**
 - Review artifacts and checklists prior to the event and notify IPT of any issues
 - Document technical concerns, and assist the TRB with an accurate assessment of the impact

In addition to IPT members, competency SMEs, and contractor representatives, the following invitees should be considered depending on the scope of the individual program:

- Lead for the Software Support Activity [at Critical Design Review (CDR) and after]
- Resource Sponsor Operations Navy (OPNAV) Requirements Officer
- User representatives
- Fleet Support Team (FST) Leader [SRR onward and notably for In-Service Review (ISR)]
- Technical Warrant Holders and Certificate Holders (beginning with SRR-I)
- Developmental Testing (DT) personnel (beginning with SRR-I)
- Operational Testing (OT)/Naval Command Operational Test and Evaluation Force (COTF) personnel (beginning with SRR-I); and
- Representatives from all certification authorities (SSR-I and SSR-II)

3.1.3 Information Distribution

Specific actions and/or tasks and the method by which to accomplish them, supportive of SETR events, are included in Table 1 below. In addition, approximate timeframes are provided to allow all stakeholders reasonable time to complete the required actions. The timeframes vary depending on program ACAT level and complexity. The process of preparing for a SETR event should begin approximately four months prior to the scheduled review date for ACAT I-II program(s), three months prior for ACAT III-IV program(s), and two months prior for non-ACAT programs.

Table 1. SETR Event Timetable and Tasks

Time to/post Review	Task	POC
SEP Approval	Initial tailoring of reviews, identification of entrance criteria, and translation of artifacts into the SOW, CDRLs, and other program data	AIR-4.0 Systems Engineer APML APM(T&E) APEO(E) OPR (Office of Primary Responsibility)/PMA CM
3 to 4 months to Review	Review checklist for applicability of each question and tailor as appropriate (see Tailoring Guide on NSERC)	Systems Engineer APML APM(T&E) APEO(E)
	Identify relevant competencies required for TRB and solicit competency POCs (see Competency POC List on NSERC Web site) to nominate TRB representatives	Systems Engineer TRB Chair APML APM(T&E) APEO(E) APEO(L) APEO(T&E)
	Coordinate SETR dates and locations with TRB Chair	APEO(E)
	Create repository of relevant program data for TRB and subject matter expert use	Systems Engineer APML APM(T&E)
	Designate a TRB chairperson who is independent of the program team	AIR-4.0/ AIR-4.1
	Finalize checklist tailoring and tentative schedule, and submit checklist tailoring report to TRB Chair and competency POCs	Systems Engineer APEO(E)
2 months to Review	Identify TRB members	Competency Level II TRB Chair
	Finalize checklist scoring/evaluation and approve schedule; submit checklist scoring roll-up report(s) to TRB, TRB Chair, and competency POCs	TRB Chair
	Identify any special interest areas for detailed briefing	TRB Chair
	Approve TRB membership and provide go/no-go to conduct the SETR event; Send SETR invitation to all TRB members and TAEs/SMEs	TRB Chair Systems Engineer
	Lead planning meeting with APML, APM(T&E), TRB chairperson and contractors	Systems Engineer
1 month to Review	In-brief all TRB members	Systems Engineer or TRB Chairperson

Time to/post Review	Task	POC
	Review data repository	TRB members
	Interact with IPT counterparts	TRB members
	Notify SMEs of their participation	Systems Engineer and TRB members
Review	Comprehensive evaluation of area of expertise	TRB members with SME input
	Assess all technical issues relative to being able to proceed past current phase of program	TRB members with SME input
	Meet as a group, discuss findings, and provide a single integrated input regarding issues identified at the review	TRB members
1 month post Review	Review RFAs, summary assessment and findings	TRB Chair Systems Engineer APML APM(T&E) APEO(E)
	Present findings to PMA/PM and sign out memorandum and minutes	TRB Chair Systems Engineer
	Work to resolve all RFAs	Systems Engineer and IPT
As Required	Request letter of closure once all RFAs are signed off and an acceptable level of program risk is identified	Systems Engineer and IPT
	Release letter of closure to formally closeout the SETR event	TRB Chair

3.1.4 Meeting Execution

3.1.4.1 Location

The facility chosen should be adequate to ensure complete participation by all competencies and organizations. It must be able to support a meeting at the appropriate classification level to ensure effective information exchange, as well as access to data or documentation that may be required during the review. Reviews are typically conducted at a contractor or Government facility, as mutually agreed upon, or as specified in the contract. Early reviews, such as Initial Technical Review (ITR) and Alternative System Review (ASR), are more likely to be held at Government facilities, while later reviews, such as Physical Configuration Audits (PCA), can be held at a prime or sub-contractor facility. Travel and associated costs should always be taken into account when selecting the location of the SETR event in an effort to maximize the participation of all parties. The chosen facility should also support information sharing. The data environment and electronic tools utilized by the program, as well as the display devices required to share the information, must be present and functioning. Other tools such as smart boards, whiteboards, schematics, and diagrams should be available and accessible to all participants. The location

should also support posting of large-scale diagrams so that technical details are legible. Depending on the size or sensitivity of the review, phone bridges may not be feasible solutions. Systems Engineers must understand the facility's capabilities and limitations for presenting information and data prior to the event to facilitate a successful review.

3.1.4.2 Classified Material

Because reviews establish the system-level baseline maturity, classified material must be reviewed to ensure a complete and integrated evaluation by the technical team. Classified portions of the design should be reviewed by smaller groups as limited by "need-to-know" criteria, but facilities should support a complete system-level presentation of unclassified and classified portions of the design to the TRB as required.

To support a complete systems review, every effort should be made to align the presentation of any classified elements of the design with the larger unclassified representation; this fosters proper risk identification.

3.1.4.3 Review Agenda

SETR events are intense examinations of a system's maturity and require an articulated plan to facilitate event completion during the allotted time period. SEs need to ensure that the focus is on the system's technical assessment and assist the TRB Chair in keeping the TRB on task. **Discussions that go beyond defining a problem and extend into exploring the potential solution should be limited to keep the review on schedule.** Once a problem has been clearly defined and documented, the discussion should move on.

In general, the SETR Event standard review agenda should include:

Introduction/Agenda/Administrative

- 1) Greeting
- 2) TRB Chair
- 3) RFA procedures overview
- 4) Risk Assessment procedures overview

Program Overview

- 1) Program Schedule/Program Budget (includes Government and contractor/subcontractor management resources and staffing levels)
- 2) Government and Contractor Technical Management Processes (e.g., SE, safety, security, Configuration Management (CM), etc.)
- 3) Design Overview
- 4) System of Systems (SoS) Architectural Views overview
- 5) Interoperability
- 6) System Concept of Operations (CONOPS)

- 7) Program Risks
- 8) Review RFAs from previous review, as applicable
- 9) Review Program Assessment

Requirements

- 1) Key Performance Parameters (KPP), Key Systems Attributes (KSA), Measures of Effectiveness (MOE), and Measures of Performance (MOP)
- 2) Design Reference Mission/Spec Missions
- 3) Functional Requirements Trace and Completeness
- 4) Verification/Certification Requirements
- 5) Representative DT/OT Missions
- 6) Design Decomposition/System Concept
- 7) Test and Certification Requirements
- 8) Logistics/Manpower Requirements
- 9) Training Requirements

Detailed Review of System and Subsystems

- 1) Segments and Subsystems
- 2) Software Architecture, Schedule, and Metrics
- 3) Support Equipment
- 4) Trainers
- 5) Trade Studies and their results

Summary and Wrap-Up

- 1) Review of RFAs/RFIs
- 2) Risk Assessment Summary
- 3) Closing Remarks

Discussion should also include where the SETR event information will be posted in the program's data environment.

3.1.5 Addressing Technical Issues

All action items generated at a technical review should be captured and addressed. Critical deficiencies may include:

- Technical approach does not meet the performance specification
- Technical approach does not meet other mandatory non-functional requirements (e.g., safety or security)
- A KPP may not be met (even if technical approach meets specification requirements)
- The system may not be suitable and/or effective

Any action item that is satisfied prior to the conclusion of the review should be captured under the appropriate category and declared "Closed" with the appropriate supporting information. The following should be used to categorize action items:

- **RFA:** Critical action item required to close the Technical Review.
- **RFI:** Action item to only provide information/data in support of the current review (not required to be completed to close the Technical Review).
- **Action to Minutes (ATM):** Action items can be programmatic in nature, which are not required to close the Technical Review. Planned close-out date should be tied as entry criteria to a future MS.
- **Not Accepted:** Category used to document any action items generated at a Technical Review that were duplicates of other accepted action items or otherwise declined by the Chairperson/TRB. A clear statement must be included in the Action Item database to indicate why each action item was categorized as “not accepted.” This category should not be used to capture action items that were satisfied/closed prior to conclusion of the review.

3.1.5.1 RFA Form

The latest RFA Form, NAVAIR form 4355/4 (10/14), shall be included as part of the technical review report. This form is a means of documenting where a technical or design approach/change does not appear to meet the specification requirement(s). The form may also be used to track RFIs, action items or document specific issues as minutes for a technical review. Refer to Appendix A for a sample of this form.

3.1.5.2 RFA Initiator

The upper portion of each RFA should be completed by the person identifying the action and may be supplemented by additional sheets as required. It is the responsibility of the person identifying an action to complete the first portion in sufficient detail to clearly document the issue.

Specific entries are as follows:

Type – Indicate type of review.

Assignment – Indicate the intended use of the form.

Subject/Title – Enter a short title for the item discussed.

Subsystem Panel – Indicate the technical review data package or panel session where the problem was identified.

Request No – Number assigned by the TRB Recorder for tracking purposes.

Referenced Document – List a paragraph reference to the design specification, SOW or its applicable requirement document.

Specific Problem or Concern – Define a problem in clear, concise terms that can be understood and answered. Relate the problem to either a specification requirement not met or a technical specification change required.

Recommended Action – Self-explanatory.

Recommended Category – Assign category according to the following definitions:

- **Category I – Within the scope of the current contract.** When approved by the Executive Session, action will be initiated as specified on the RFA format to meet the estimated completion date. The RFA constitutes authority to proceed, and no further direction is required.
- **Category II – Not within the scope of the current contract.** When approved by the Executive Session, and when directed by the Navy contracting officer, the contractor will prepare either a cost and schedule impact statement or a formal proposal, as indicated, and submit to NAVAIR.
- **Category III – Rejected.** By agreement of the TRB or at the Executive Session, no further action will be undertaken.

Recommended Urgency/Date – Assign the urgency according to the following definitions, and a recommended completion date:

- **Level 1** – Indicates the existence of a hazardous condition such as safety of flight (SoF) or personnel hazard.
- **Level 2** – Indicates the existence of condition(s) requiring attention that could affect mission performance.
- **Level 3** – Indicates desired, but not mandatory, design improvements or changes that would improve mission or aircraft performance.

Initiator's Name/IPT, Activity/Code, Phone, and Date

3.1.5.3 Integrated Product Team (IPT) Response

The IPT personnel should document the responses to problems or concerns. Specific entries are as follows:

Proposed Action – The appropriate IPT person should add pertinent facts regarding the RFA to include comments on discrepancies, recommended actions, alternate recommended actions, and impacts.

Proposed Schedule – Provide the best available estimate of the schedule for accomplishment of the recommended action.

Recommended Category/Urgency/Date – Enter per category/urgency level definitions given previously, and the recommended completion date.

Engineer's Name, Function/Department/Phone, and Date – Enter the information for the IPT member assigned to prepare the response and the date of the response.

3.1.5.4 Executive Session

Following the IPT response with the proposed action and categories, RFAs should be referred to the Executive Session for resolution of any differences between NAVAIR and contractor positions. The final Executive Session decision, assigned category, urgency level, and the scheduled completion date should be recorded. An assessment of the impact of this decision upon the program should also be indicated. The program and contractor representative signatures, followed by the TRB Chairperson's signature, should be entered as a concluding event after the disposition of the RFA has been determined.

3.1.6 Review Closeout

A review is considered complete when:

- All RFAs are signed off,
- Results are reviewed by the appropriate board representative(s) and the TRB Chairperson, and
- An acceptable level of program risk is ascertained.

After the RFAs are closed, the system SEs should prepare a letter for the TRB chairperson formally closing the review.

A data package shall be prepared containing the final brief, including any changes to reflect the completed RFAs, and a copy of the closure letter for submission to the AIR-4.1 SEDIC. Contact the SEDIC at SEDIC@navy.mil when the package is complete. Do not send information requiring special handling (e.g., proprietary information) without making appropriate handling arrangements with SEDIC personnel.

3.2 Baselines

3.2.1 Composition of a Baseline

Baseline – A specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be changed only through a formal CM process.

In this definition of a baseline, it is important that the word “product” is used because a baseline represents more than just a specification. At the lowest level, the product baseline represents the full Technical Data Package (TDP), including specifications, architectures, drawings, analysis, models, etc., of the system.

The baseline provides traceability from the high-level capabilities developed in the Early Engineering Analysis Phase to the detailed design accomplished in the Engineering and Manufacturing Development (EMD) Phase, for an unbroken “end-to-end” concept realization. The maturation of the baseline is assessed at technical reviews along the acquisition timeline to determine if the level of decomposition is consistent with the expected level of maturity.

3.2.2.1 Capability Baseline

The capability baseline identifies the highest-level requirements for a SoS. To form the SoS requirements, the various capabilities are collected or developed and packaged to form the new capability that is desired by the enterprise. The capability baseline is established at the ITR.

3.2.2.2 Objective Baseline

The capability baseline is functionally decomposed to allocate the required SoS capabilities across the systems that make up the SoS. This resulting capability distribution forms the objective baseline for each pillar program. The objective baseline identifies key objectives required to fully develop the SoS capabilities in an operational, supportable and maintainable manner. This baseline serves as the transitory effort to hand off the SoS effort to programs to continue the design and development in the context of the preexisting system or system to be developed. The objective baseline is established at the ASR.

3.2.2.3 Performance Baseline

The performance baseline translates the high-level objectives found in the objective baseline into performance-based language and captures pertinent design criteria necessary for system development. It defines the required system performance as described in the Performance-Based Specification (PBS) and associated architecture. The requirements in this baseline are traceable to and derived from the objective baseline. This includes threshold attribute values that are directly related to the KPPs and KSAs. The performance baseline is normally established and managed by configuration control at the SRR.

3.2.2.4 Requirements Baseline

The requirements baseline describes the work the contractor does to translate the specification that is placed on contract into the lower-level detail for the contractor's portion of the system development. This baseline should document the common understanding between the Government and contractor for the functional and performance requirements of the product being developed.

In some cases, responsibility for a system-level requirement may be shared between the Government and contractor. For instance, an Operational Availability requirement may be a system requirement, but it cannot always be met by the contractor by themselves. The contractor can be held responsible for the Mean Time Between Failure (MTBF) of the system they are developing. However, other elements that make up Operational Availability, such as Mean Logistics Delay Time (MLDT), are the responsibility of the Government. The requirements baseline would capture this and only hold the contractor accountable for their portion of the system requirement; in this case, just the MTBF.

3.2.2.5 Functional Baseline

The functional baseline is the definition of the required system functionality describing interface characteristics of the overall system, and the verification required to demonstrate the achievement of those specified functional characteristics. This baseline is derived from the

performance baseline established at SRR and normally includes a detailed functional performance specification for the overall system and the tests necessary to verify and validate overall system performance. The functional baseline is normally established and managed by configuration control at the System Functional Review (SFR). It is usually verified with a Functional Configuration Audit (FCA) and Production Readiness Review (PRR).

3.2.2.6 Allocated Baseline

The allocated baseline consists of system function and performance requirements definition allocated across lower-level configuration items. It includes all functional and interface characteristics that are allocated from the top-level system or higher-level configuration items, derived requirements, interface requirements design constraints, and the verification required to demonstrate the traceability and achievement of specified functional, performance, and interface characteristics. Configuration control of lower-level configuration items that make up the Allocated Baseline are validated through CM Audits to establish the lower-level configuration items Functional or Product Baselines as applicable. Typically, these audits are conducted by the Lead System Integration (LSI) against the work accomplished by their lower-level vendors; however, the Government may become directly involved when acting in an LSI capacity.

The performance of each configuration item in the allocated baseline is described in its preliminary design specification, as are the tests necessary to verify and validate configuration item performance. The allocated baseline is usually established and managed by configuration control at each configuration item's (hardware and software) Preliminary Design Review (PDR), culminating in a system-allocated baseline established at the system-level PDR.

3.2.2.7 Product Baseline

The product baseline is the documentation describing all of the necessary functional and physical characteristics of a configuration item; the selected functional and physical characteristics designated for production acceptance testing; and tests necessary for deployment/installation, operation, support, training, and disposal of the configuration item.

The product baseline includes "build-to" specifications for hardware (product, process, material specifications, engineering drawings, and other related data) and software (software module design – "code-to" specifications). The product baseline is usually established and managed by configuration control at each configuration item's CDR, culminating in an initial system product baseline established at the system-level CDR. This is referred to as the Product Baseline (initial).

Until completion of the FCA and/or PRR, Class 1 changes shall be those changes that affect the Government performance specification. Following the FCA/PRR, the Government will further define contractually what constitutes a Class 1 change in accordance with NAVAIRINST 4130.1 and the program's CM plan. The system product baseline is validated at the PCA. This is referred to as the Product Baseline (final). The PM assumes configuration control over the product baseline (final) after the system-level PCA and controls all Class 1 changes.

3.2.3 Baseline Usage

The establishment of baselines throughout the system life cycle has several advantages. Primarily, it provides an opportunity to evaluate the design maturity at each technical review. The level of maturity expected can be measured and assessed to evaluate the risk of proceeding with the next phase in the life cycle, and highlighting any issues that need to be addressed to achieve technical review maturity goals as defined by SETR Entry Criteria and associated questions.

Baselines also allow programs to place defined contract deliverables within the new acquisition life cycle. Currently, the design effort is parsed between Technology Maturation and Risk Reduction (TMRR) and EMD. This separation makes it difficult to define the level of design maturity required for a particular phase. However, if a baseline approach is used, the baseline can be used to scope the contract effort of the TMRR phase to a PDR level of maturity by requiring the development of an allocated baseline.

This flexibility also allows the Government to perform LSI efforts by defining alternative contract entrance points. For example, in the development of a new air vehicle, the Government may decompose the performance requirements below the SRR level of maturity. The Government could perform the functional analysis and allocation to establish the functional baseline and hold an SFR prior to awarding contracts for smaller portions of the air vehicle.

3.2.4 Configuration Management (CM)

Configuration Management (CM) policy and processes are required from the outset of any project and must be mandated via contract and captured in the Office of Primary Responsibility (OPR)/Program Offices Configuration Management Plan (CMP) before any SETR Reviews are conducted. CM facilitates the orderly development of a system through establishment of the technical baseline (including the capability, operational, performance, functional, allocated, and product baselines), and their assessment and approval at various technical reviews and audits. Upon approval, the baseline is placed under formal configuration control. Through CM, the program identifies, controls, and tracks changes to system baselines, ensuring changes occur only after thorough assessments of performance, cost, and schedule impacts and associated risks, in accordance with NAVAIRINST 4130.1.

3.3 Contractual Issues and Recommendations

A clear understanding of the technical baseline required for each review is essential for the contractor to understand readiness for entrance into the review. This baseline is supported by analysis documents that are usually required as CDRLs or delivered as program data. The design is ultimately captured in the contractor's TDP. The SEP should clearly state the expectations for this documentation as entrance criteria for each SETR event, and these expectations must be consistent with the Engineering/Data Requirements Agreement Package (E/DRAP). The contractor should identify the specific technical documentation taxonomy that meets the criteria

established in the SEP. This information is a clear explanation of the contractor's technical taxonomy and its alignment with each baseline, and should be documented in the SEMP.

3.3.1 Facilitating Stakeholder Review

The SETR process is a stakeholder review by the acquirer to ensure that the supplier, or contractor, is developing a system that can ultimately be accepted and deemed operationally effective and suitable. A systems engineering process that has been well-executed by the contractor will include documentation of the requirements, design, and verification/validation, etc., in sufficient detail to facilitate this evaluation. The Government's technical team shall review and assess the contractor's design, supporting documentation, and accompanying analyses to ensure they are adequately matured.

While it is not mandatory that all documentation be delivered in CDRLs, there is no guarantee of timely access by the Government unless a formal agreement is established. CDRLs may include computer-based models that contain the required technical information vice a more traditional document. The inability to access contractor information and assess their work will ultimately translate into an assessment of increased risk by the Government technical team.

It is imperative that the contracting parties reach an agreement as to the fundamental purpose of the SETR events and audits in context of the terms and conditions of the contract. This handbook clarifies that the purpose is to evaluate, at particular points in time, the progress of a system's design or development towards meeting the Joint Capabilities Documents (JCD), Initial Capabilities Documents (ICD), Capability Development Documents (CDD), and Capability Production Documents (CPD). As this iterative process progresses, the SETR events and audits become increasingly detailed, and as such become more focused on the final system configuration, implementation, and support.

3.3.2 Recommended Language

The IPT should coordinate with the Procuring Contracting Officer (PCO) to incorporate a standard clause into the contract, "H-X SIGNIFICANCE OF SYSTEMS ENGINEERING TECHNICAL REVIEWS REQUIRED UNDER THIS CONTRACT," as designated by AIR-2.0 to clarify the role of the SETR process in the context of contractual agreements. A sample of this clause can be found on the NSERC NAVAIR Systems Engineering Web page:

<https://nserc.nswc.navy.mil/navair/NAVAIRSE/policyguidance/SitePages/ContractLanguage.aspx>

This clause essentially states that the review process and any results of the reviews do not eliminate the contractor's responsibility to meet the contract requirements. The clause also states that, regardless of Government interaction in the SETR process, the contractor maintains design and Systems Engineering responsibility for the system in accordance with the terms of the contract.

4. Emerging Processes

4.1 Architecture

As systems increase in complexity, it is necessary to develop new methods to manage. Architectural frameworks and modeling are methods available to assist the SE with that management. Architecture aids in visualizing the system or SoS and facilitates better communication by providing a concise, unambiguous representation of the system of interest, the desired capabilities, and its required functions. This improved communication amongst Stakeholders, Sponsors, Developers, and Implementers results in the common understanding required to manage complex systems development.

4.1.1 Benefits

Defining an architectural model prior to detailed requirements generation has proven helpful to programs. Architecture to model the operations and developed use cases provides visualization of the dependencies between activities and functions, highlighting interoperability requirements and easing traceability. Architecture, when traced to requirements, will enable deficiencies to be discovered and resolved to increase the accuracy of the requirements set earlier in development. As the Government takes on the LSI role, the need to identify and clearly specify interfaces will continue to grow in importance. The process of defining architecture leads the Systems Engineering team to define system functional, behavioral, and physical and software interfaces for the weapon system or Program of Record (POR), helping to identify interfaces early in the development timeline and thereby saving time and money.

Requirements generated after an architectural model has been developed tend to be more complete, less redundant, and less ambiguous. An architectural model should define the functions the system is required to perform, by specifically identifying the functions needed to enable the desired capability. Typically, functions and actors are identified through generating a series of use cases. This information is developed into a logical decomposition of functions, referred to as “architecture.” The requirements become a description of that functional architecture and have a clear relationship to their desired outcome. The linkage of function to requirement still allows the designer to determine how the requirement will be fulfilled (i.e., which subsystem, component, board, etc.) but leaves the SE in control of what the system must do (e.g., loiter at a given altitude for a minimum number of minutes). Constraints and performance requirements also exist and must be tied to the architecture, which enables a bridge between the logical and physical architectures.

An architecture with the requirements linked to the functional and physical/software model of the system provides the ability to do change impact analysis. When requirements are linked to functions (and eventually functions allocated to systems, subsystems, and components), a change to the requirement or function can highlight resulting gaps that result from interfaces with other parts of the system. The concepts used in the development of architectural models are scalable,

and can be used to define systems, subsystems, components, etc., or can be scaled up to the mission or SoS level.

Architectural models are collections of data that describe systems using a standard modeling language [i.e. Unified Modeling Language (UML)]. These models, or architectures, are used to capture and represent maturing technical baselines. When used to their full potential, architectural models offer the following:

- Rapid assessment of the system of interest, including functional characteristics for determining technical requirements compliance.
- Understanding of the impact of decisions across the system or SoS; the relationship of architectural elements can highlight gaps or redundancy in many areas of the model, including: capabilities, functions, and requirements.
- Provide Department of Defense Architecture Framework (DoDAF) artifacts.
- DoDAF standard views facilitate discussions by providing a commonly defined method of describing system characteristics.
- DoDAF artifacts are required by Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01H, dated 10 January 2012.
- These artifacts are defined views from within a mature architectural model.
- Reduce the reliance on paper artifacts because the information is stored and represented in an integrated digital modeling environment.

4.1.2 Standard Work Packages

Standard Work Packages (SWP) will provide a common approach to standardize the processes, tools and ability to develop accurate and cost-effective DoDAF architecture products for capability assessment and design of weapon systems and SoS. The resultant effort will enhance the conventional systems engineering processes with sound technological model-centric methods and tools to meet system design in an automated, accurate and cost-effective manner, thereby streamlining the system development process and reducing technical process and document generation timelines.

4.1.3 Resources

For more information about Architectural Modeling, see the NAVAIR Systems Engineering Homepage at:

<https://nserc.nswc.navy.mil/navair/navairse/SitePages/Home.aspx>

OR contact the Systems Requirements Analysis and Architectures Division.

A table describing the linkage between Acquisition Phase, Baselines, Reviews, and Architecture is available in Appendix C.

4.2 Agile

4.2.1 Agile Software Development Methods

Agile software development is not one specific method; it is both a philosophy and an umbrella term for a collection of methods or approaches that share certain common characteristics. While there is no universally accepted formal definition for Agile, a good working/informal definition from an Agile software development practitioner is: “Agile is an iterative and incremental (evolutionary) approach to software development that is performed in a highly collaborative manner by self-organizing teams within an effective governance framework, with ‘just enough’ ceremony, that produces high-quality solutions, in a cost-effective and timely manner that meets the changing needs of its stakeholders.”

The Agile philosophy is embodied in the four tenets of the Agile Manifesto and the 12 associated principles generally accepted throughout the software development community. Various Agile methods [e.g., Scrum, eXtreme Programming (XP), Adaptive Software Development, etc.] have been – and continue to be – created following these tenets and principles, which are intentionally vague to allow flexibility and creativity. Each software developer determines their own specific, well-defined Agile development methods/practices that conform to the tenets and principles, and also meet their unique needs.

There are many Agile methods, and each emphasizes different aspects of Agile. For example, the Agile Scrum method has a heavy software management emphasis (e.g., daily team meetings and a sprint-based life cycle). Another example is XP, which emphasizes the technical aspects of Agile (e.g., pair programming and continuous integration). Each software development team will select the method(s) that most closely aligns with its goals (e.g., effective small-team leadership practices, and increased efficiency and reduced waste). The Government must understand the benefits and challenges associated with the method proposed by the software developers, and how that method may introduce new risks into the program.

4.2.2 Incorporating into SETR

4.2.2.1 Agile Software Development Integration within SETR

Agile software development methods do not naturally integrate well with the traditional SETR approach. SETR and Agile processes have differences that require careful consideration to enable their integration. In the traditional SETR timeline, the whole system is generally matured at the same rate and each SETR event is held when a sufficient portion of the system has reached the required maturity level for that SETR review. However, Agile software methodologies develop/mature software in “pieces” at different rates and times, and effectively “outpaces” the traditional SETR timeline in many areas.

If a SETR event is scheduled based on the pieces of software that mature earliest, then a significant portion of the software will be too immature for the review. Alternatively, if a SETR event is scheduled based on the pieces of software that mature later, two options exist:

- 1) Continued progress on more matured software pieces would halt while waiting for less mature pieces of software to “catch up,” or
- 2) Progress would continue prior to the SETR review.

The first option delays progress on the early capabilities developed and the second option allows the early capabilities to continue progress, but at risk, since there is no independent review.

One of the overarching goals of Agile methodologies is to maximize productivity. Delaying the continued development of one piece of mature software to wait on a less mature piece of software to “catch up” in order to hold a SETR review is counter-productive. It is also necessary that the TRB be allowed to independently and periodically verify the technical progress and associated risk as the program matures. Therefore, the SETR process was adapted to better accommodate Agile software development processes with the introduction of incremental software reviews in NAVAIRINST 4355 Series. However, with the frequency of the Agile sprints and their short duration (i.e., two-four weeks, vice three or more months for traditional incremental), holding the recommended set of reviews (SSR, CDR and IRR) for each sprint is a challenge and is not always feasible.

4.2.2.2 Sprint Reviews

The Scrum method, which is one of the most widely used, leverages the use of sprints, scrums, and a requirements backlog. Requirements pending implementation are maintained in a “requirements backlog.” Work is accomplished in Sprints, which are short work periods during which a subset of the requirements backlog are coded and tested/verified. At the start of each sprint, a subset of outstanding requirements is selected for implementation. During the sprint, a daily scrum meeting is held to review the execution technical progress and issues, as well as personnel/resources issues that may impact progress coding/testing the requirements.

Based on these rapid daily assessments, the requirements being worked in the sprint will be modified, i.e., some requirements may be dropped from the sprint and returned to the backlog, and others pulled into the sprint from the backlog. The primary criteria will typically be maximizing the productivity of the work group. For example, a complicated requirement that requires a highly skilled individual may be dropped from the sprint due to unforeseen circumstances, while less complicated requirements are pulled into the sprint from the backlog to keep that individual’s assistant fully productive.

This approach is flexible and can accommodate changes to requirements (e.g., new, missing, and deficient requirements). Changes/corrections to requirements are entered into the requirements backlog that can be worked in a subsequent sprint. However, to maintain configuration control and prevent requirements errors or creep, changes to requirements still require engineering and CM rigor per established processes before changes are accepted into the requirements backlog. High priority changes/corrections can be absorbed into earlier sprints and can be quickly implemented because sprints are short in length. Because sprints are short, requirement

modification can be worked quickly into a subsequent sprint without impacting the current work in progress unless the priority of the change warrants.

Managing the scope of the sprint can prove to be a challenge to the Government. To begin with, the criteria for prioritizing the requirements to be implemented for specific sprints may not be the same for the Government and the software developer. The Government's primary concern will be the priority of the requirements (e.g., the marginal cost and/or the contribution to the overarching capability), whereas the developer may be focused on productivity (which may be more focused on implementation complexity/resources vice priority). Additionally, these different viewpoints may also be exacerbated when sprint scope changes during daily scrums.

Furthermore, many groups will plan their near term work based on the planned scope of the sprint determined at a sprint kick-off meeting. For example, Government testers will prepare procedures, facilities, equipment, etc., based on the expectation of testing the next software release against the planned requirements. When requirements being worked in a sprint are changed, this will likely impact the near-term work plans of those groups, causing rework to test plans/procedures. If the Government does not have insight into the changes occurring during the scrums, it will not have any time to adapt to the impacts these changes will have. Mitigating the risk/impacts of these challenges requires day-to-day technical collaboration between the Government and the software developer.

The updated SETR instruction (NAVAIRINST 4355.19 Series) continues the use of an incremental approach for software development and also introduces the concept of the Release Backlog Review (RBR). The RBR concept is based on the Scrum methodology, the Agile software development method most often used by software developers. These RBRs address the nature of Agile sprints, which lack formal documentation to establish baselines at each SETR review. Sprints are started following SFR/PDR after the requirements backlog is established. Scrum is based on sprints, which are the basis for the timing of the RBR (i.e., each RBR is held after a pre-determined number of sprints are completed).

The requirements, design, and test evidence accumulated across multiple sprints are reviewed at each RBR to assess the maturity of the release and to assess the requirements backlog. In assessing readiness to release the software to the Government, the primary consideration is of the maturity of the software for further Government subsystem/system integration and verification (along with completing the associated subsystem/system-level technical reviews). At this point, the software is still in the development/integration/verification process and is not being released into the field, although it will transition from the contractor's CM process to the Government's CM process. In assessing the requirements backlog, a particular point of interest should be any additions, deletions, and changes to requirements since the last RBR, and how these changes may impact the desired capabilities. Conduct of the RBR does not alleviate the need for daily collaboration between the Government and software developer. The RBR provides an opportunity for Government and developer technical leadership to formally verify the progress and backlog at periodic intervals.

4.2.3 Managing Agile

The management role in a program takes on some added dimensions when Agile software development is implemented. PMs, both acquiring (i.e., Government) and executing (i.e., software developers), need to be coaches, expeditors, and champions. If not personally performing these roles, PMs will need someone within their organization to be the responsible POC. However, adoption of any new acquisition life-cycle method requires a change in the prevailing culture, and Agile is no different. Personnel involved in any development project often hold different perspectives regarding facets of the project, such as the organizational structure, rewards system, communications, decision-making, staffing, and priorities. In an Agile software development environment, changes often occur quickly, making it critical that acquiring and developer managers understand and address these different perspectives to avoid miscommunications and errors. To meet the challenges of adopting Agile, a PMA will need to take adaptive actions. Terminology will need to be understood if terms have different meanings when using Agile. In order to employ any Agile method, the Government organization will need to plan, train and anticipate changes in the environment and business model, and apply sound work principles to make the changes a reality. Once adopted, the transparent nature of the Agile approach provides continuous and immediate insight into the state of the project as long as the developer and Government maintain a close, collaborative relationship on all technical decisions and matters.

4.2.4 Benefits

Agile methods show promise in enabling organizations to adjust to changing requirements and rapidly fielding software. In contrast to incremental-based projects, Agile seeks to deliver even smaller but functioning software segments in increments to the desired full capability. In this manner, users can begin to interact with the software system earlier, meaning users potentially receive some minimal capability early rather than waiting until the end of the full program to receive any working software. This provides the opportunity to reduce life-cycle costs by eliminating the development of unnecessary, unwanted features and rework. Additional benefits seen from using Agile Methods include:

- Early insight by the users into the actual design and implementation of the solution.
- Early and ongoing insight by the developers into user behavior, leading to more usable applications.
- The ability to change requirements and priorities throughout the life cycle (subject to established engineering and CM controls/processes).
- Opportunities to “fail fast” and make timely adjustments if the early solution ideas turn out to be flawed; little time or money is spent before that learning occurs, and redirection can be implemented.
- Bugs are revealed and addressed earlier in the process because each iteration or sprint involves unit testing and acceptance testing.

- An explicit framework for discussing priorities and tradeoffs, leading to more accurate assessments of the state of the project at any given time.
- An explicit understanding on the part of the development and acquiring organizations that the requirements are expected to evolve and are a natural part of software development and ensuring value is delivered to the customer.

4.2.5 Resources

The White House Office of Science and Technology Policy (OSTP) and the Office of Management and Budget's Office of Federal Procurement Policy (OFPP) seek to encourage greater innovation in Federal contracting. In this spirit, OSTP has compiled this collection of agency case studies to highlight different models that have been successfully tested by agencies to meet a range of needs related to research, prototyping, and market testing. The collection of case studies is found at the following web address:

http://www.whitehouse.gov/sites/default/files/microsites/ostp/innovative_contracting_case_studies_2014_-_august.pdf

4.3 Incremental Software Development

NAVAIR has instituted the option to develop and field software in an incremental fashion. Each increment should provide an operationally relevant subset of the total capability desired. The goal in an incremental approach is to allow subsets of the total capability that mature more quickly to pass through the development/integration and the SETR process, to ultimately be fielded faster without being delayed by other portions of the total capability that mature at a slower pace. Operational priorities and available funding will typically drive the content of individual increments. Fielding of a completed increment is accomplished per the applicable PMA/Program CM Plan.

This approach begins with an Incremental SSR (SSRinc) that is held after the system SFR. The purpose of the SSRinc is to review the requirements for the current software increment. The SSRinc is followed by an Incremental CDR (CDRinc) to assess the design of the software increment and an Incremental IRR (IRRinc) to assess readiness for integration. At the system PDR, the software architecture will be established and the completed software components (of pre-PDR increments) will be evaluated against the architecture and system/subsystem requirements allocated to software along with the requirements and/or design for the next increment as shown in Figure 3. To maintain consistency with an incremental SETR approach, Configuration Audits and Assessments can also be conducted on an "Incremental" basis, per NAVAIRINST 4130.1, to match the requirements of the project and to minimize risk. This process may be further scrutinized when dealing with a software-only program.

At the system CDR, the software architecture will be confirmed and the completed software components (of pre-CDR increments) will be evaluated against the architecture and system/subsystem requirements allocated to software along with the requirements and/or design

for the next increment. If there is only one increment to the software, the NAVAIR system-level SSR, CDR and IRR will be used for establishing the software technical baselines. For software increments that are three months or longer, the program should conduct incremental SSRs, CDRs, and IRRs.

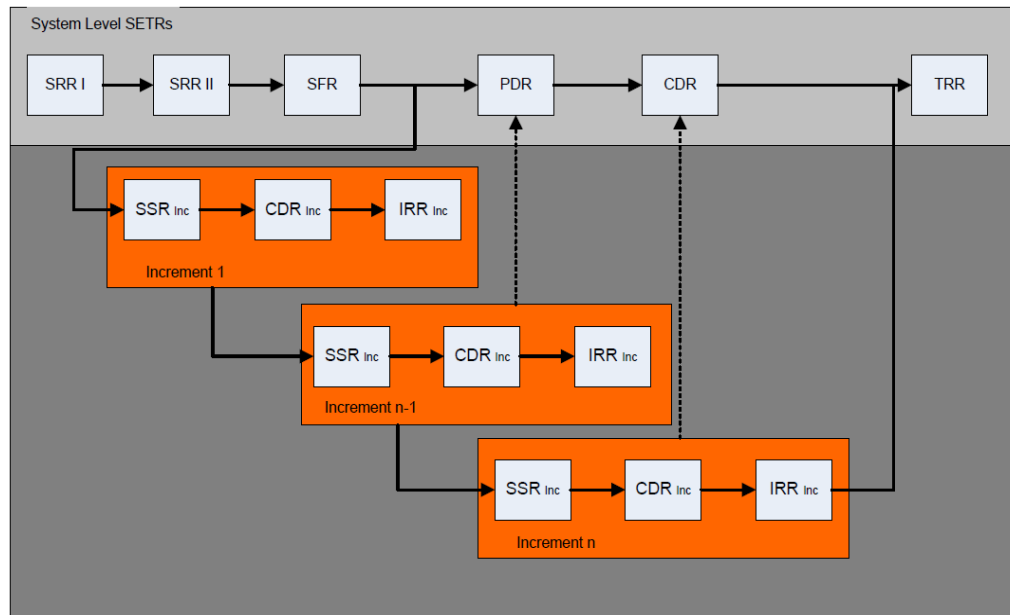


Figure 3. NAVAIR Software Increments and SETR

4.4 Model-Centric Systems Engineering (MCSE)

It is almost universally recognized that poor requirements definition can lead to increased program costs, and even program failure. Because program budgets are determined early in a program based to a significant degree on the requirements set, eliminating requirements errors should allow for better cost estimates and reduced program risk. However, modern SoS involve a level of complexity that exceeds a human being's ability to fully comprehend and evaluate the SoS in a single viewpoint.

Historically, NAVAIR's systems engineering process has been document-centric with the focus being the performance specification. The primary tool to manage the specification are various requirements management tools, such as Dynamic Object-Oriented Requirements System (DOORS), that provide some limited degree of traceability, but do not provide a means to measure the completeness or correctness of the requirements set described in the specification.

Various industries (both related – and unrelated – to DoD) have been moving to MCSE for several years, and DoD has been working to follow suit. MCSE provides a method for developing a better understanding of system behavior before writing the performance specification, and then identifying performance requirements based on the system functions

required to implement those behaviors. Computer-based models can also provide multiple integrated (i.e., linked and related) views (e.g., architectural, functional, requirements, and test) of the SoS being developed at the subsystem, system, and SoS levels, which are refined as the model matures. The integration of these views in a digital environment allows for a more comprehensive (and automated) evaluation to identify inconsistencies and/or gaps in the model and to assess impacts through the SoS at all levels when changes are proposed. Under an MCSE approach, the focus is the model, and the specification is a product of the modeling process. This approach tends to be more dynamic and comprehensive than a document-centric approach.

The basic steps of a MCSE approach can be summarized as:

- Model system functional behavior(s) required to accomplish desired capability(ies).
- Generate a functional hierarchy from the model.
- Develop performance requirements for each functional element (with due consideration for external constraints, such as programmatic, safety, and security requirements imposed by US statutes, DoD regulations and MILSTDs, NAVAIR policy, etc.).
- Develop verification requirements for each performance requirement.

The key is to first understand the system behavior and identify the supporting system functions (including allocation of those functions to component systems and subsystems depending on the level being analyzed/developed) through modeling, before writing the performance requirements. Do not focus on writing the performance specification; let the modeling process lead to identifying the requirements, and allow the performance specification to be the product, vice the focus, of this process.

MCSE is in an early stage of adoption within NAVAIR. Numerous modeling tools are available from different vendors throughout Industry. This handbook does not endorse or recommend use of any particular modeling tool; the tool to be used should be chosen based on individual program needs and coordinated with each program's industry partners.

5. Entry Criteria

5.1 Purpose

Entry Criteria provide a structured framework to examine readiness and maturity for entrance into, and assessment of, the program under review.

5.2 Structure

The Entry Criteria for every SETR event has been grouped into three categories:

- 1) System Requirements, Traceability, and Design
- 2) Test, Evaluation, and Certification of Product
- 3) Project Management and Execution (Planning, Assessment, and Control)

The complete list of Entry Criteria is provided, as an Enclosure, with the 4355.19 Series Instruction.

5.3 Assessing Maturity

Each technical review has a standard set of Entry Criteria tied to the required level of design/development maturity for that phase of the program based on generic program requirements. **The criteria should be tailored to the program of interest and detailed in the program SEP.** Reviews are conducted once the SE determines that the required artifacts have reached the required level of maturity. Any artifacts that have not reached the required maturity shall be assessed for the associated risk to determine if the SETR event may still be held. The program's maturity level is demonstrated through the scoring of the individual questions for the review's Entrance Criteria. The Exit Criteria for a SETR event is achieved when the TRB Chair concurs that the program has demonstrated adequate maturity in accordance with the Entrance Criteria, that an acceptable level of risk exists, and all RFAs are closed.

6. Tailoring

6.1 Overview

The primary function of the SETR process is to provide appropriate independent technical oversight of the development effort in order to provide the PM with an assessment of design maturity and program and/or technical risk. The SETR process is intended to be tailored to accommodate application to the entire spectrum of programs that vary in size, complexity, risk, and acquisition strategy. Tailoring of the SETR process is essential to ensure efficient and effective application of the process. In addition to tailoring the SETR event scope, the SETR events may also be tailored through the use of an incremental approach. Similarly, configuration audits and assessments can also be tailored and/or conducted on an “incremental” basis to match the requirements of the project and to minimize risk. Details of Incremental Audits and Assessments can be found in NAVAIRINST 4130.1 (series).

In general, SETR tailoring eliminates unnecessary, out-of-scope, and no-value added documentation while preserving systems engineering rigor. In some cases, tailoring, beyond applicability, often has the effect of reducing SMEs’ exposure to substantiating evidence of design maturity and associated program and/or technical risk in exchange for cost and/or schedule. This approach is usually associated with cost and schedule constrained programs (i.e., Rapid Acquisition Programs), where a higher-risk posture is acceptable during program execution. Thus, tailoring decisions must be made based on the assessed program risk and be consistent with program risk posture. Tailoring decisions must be coordinated with competency SMEs, APEO(E) and adjudicated with the PM and documented within the program SEP.

6.2 Planning

As part of the SE planning, the SE tailors the SETR processes appropriately for programs and documents the tailored approach in the SEP. The authority to tailor the SE process, and individual SETR events, should be viewed as recognition that one-size SETR does not fit all programs, and allows the SETR process to be adapted to provide the requisite level of systems engineering rigor necessary for effective programmatic decisions. SETR tailoring should not be viewed as a method to skip steps or to eliminate the entire process.

SETR tailoring allows for adjustments to the number of reviews/audits, entry criteria, required documentation, etc., and focuses the process on risk areas that are more critical to program success. Therefore, the appropriate level of tailoring (breadth and depth) can be best determined on the basis of a thorough program risk assessment to establish a baseline understanding of related program risk, complexity, and number of unknowns.

6.3 Breadth and Depth

SETR tailoring takes the form of **deletion** (removal of reviews/elements not applicable), **alteration** (modifying reviews/elements to more explicitly reflect the application to a particular effort), or **addition** (adding reviews/elements to satisfy program requirements/complexity/risk).

Tailoring, in breadth, deals with number and type of SETR reviews and audits. SETR tailoring in-depth involves decisions concerning the level of detail needed to generate and substantiate the outputs necessary to satisfy requirements and/or contractual objectives. This is often referred to as SETR Checklist tailoring, which includes decisions concerning review entry criteria, tasks, and documentation required to generate substantiating evidence to assess design maturity, technical/program risk, and contractual compliance. Appendix F provides a notional list of SETR artifacts that should be tailored for each event.

The breadth and depth of tailoring the SETR process and checklists varies from program to program in relationship to program complexity, uncertainty, urgency, and the willingness to accept risk.

6.3.1 Tailoring Process (Breadth)

Determine the number of SETR events and audits:

- Determine that the type of life-cycle model is appropriate to the project. For example, if the project is a Pre-Planned Product Improvement (P3I) or an incremental change to an existing program, then smaller, “delta” reviews might be appropriate, and should be scoped accordingly. This will also aid in determining where on the acquisition framework the project will begin.
- Determine which reviews and audits are necessary based on where the program enters into the acquisition framework. Reviews and audits may be retained, combined with other reviews or audits, or eliminated entirely.
- Determine the program risk posture – willingness to accept risk in exchange for reduced cost and/or schedule.
- Review program risk areas – including requirements, technology maturity, and system complexity.
- Engage with TAEs/SMEs to ensure buy-in on the appropriate level of oversight retained after tailoring. This should be done prior to first formal review as part of the E/DRAP discussions.
- Determine if additional reviews or audits are necessary based on system complexity, risk, or safety requirements.
- Document the rationale for all tailoring decisions, including an assessment of any related risk.
- Coordinate and/or approve SETR tailoring by Program Manager, Senior PMA SE, APEO(E) and TRB Chair.
- Ensure the program SEP reflects the final SETR tailoring.

6.3.2 Tailoring Process (Depth)

Elements of the SETR event or audit:

- Tailor SETR entry criteria and questions based on scope, complexity, risk posture, and acquisition strategy. This will minimize any unnecessary and potentially duplicative activities and helps achieve a better balance between cost, schedule, and requirements. For example, for modifications or additions to existing programs, structuring the rapid acquisition in conformance with the existing program's SEP allows for the elimination of a stand-alone SEP for the rapid acquisition program.
- Each item that is tailored out must have a sound rationale for its elimination documented in the checklist. Avoid broad statements such as "Not Applicable," because that provides no rationale.
- Safety and Information Assurance (IA) requirements should generally not be tailored out. However, programs may be able to leverage existing program office Safety and IA artifacts and processes to minimize rework. Additionally, tailoring certification requirements, such as Clinger-Cohen and Environment, Safety and Occupational Health (ESOH), may only be done after consulting the respective TAEs for guidance.
- Each item that is tailored out should be discussed with the appropriate competency to ensure concurrence with the tailoring.
- Tailoring decisions must be assessed for risk and adjudicated with the program manager.
- Document all tailoring decisions and rationale, including assessed tailoring-related risk.
- All SETR Checklist tailoring must be coordinated and/or approved by Program Chief Engineer (CHENG), APEO(E) and TRB Chair.

6.4 Rapid Acquisition Programs

In addition to the SETR tailoring, the following areas of emphasis should be considered for rapid acquisitions when tailoring:

- Recommended list of SETR events should include SRR (I/II), PDR, CDR, and TRR. These reviews afford the minimum visibility necessary to monitor and assess design maturity and technical/program risk.
- NOTE: Elements of other reviews may be incorporated to lower technical risk. For example, SFR activities may be included in the SRR-II or PDR depending on the level of system understanding at the time of the review. Similarly, elements of the IRR may be incorporated into the CDR if there is a high degree of Off-the-Shelf (OTS) components.
- Software-related reviews may also be combined with related technical reviews. For example, ASR and SSR may be combined with the PDR.
- In addition to formal design reviews, it is recommended that the team conduct informal working groups to work out issues with the contractor as they arise. Examples include:
 - Interface Control Working Groups (ICWG) between all Government and contractor teams. While not providing formal oversight, additional ICWGs can

assist in mitigating risks and in better understanding of system architecture and critical interfaces.

- Incremental Design Reviews for sub-components. These “mini-design reviews” allow for visibility into the design and design oversight of sub-components and components instead of waiting for the formal design review.

6.4.1 Other SE Considerations

- Risk Management: Due to the accelerated timeline and elimination and/or merging of reviews, many areas of the program will not have sufficient development to mitigate technical risks. An expanded and robust risk program will aid in managing the increased technical risk inherent in the accelerated program timeline. Iterative risk characterization will assist in identifying where the program pressures are.
- Due to the accelerated timeline, thorough contingency planning is not possible. It is recommended that the SE develop mitigation “off-ramps” as part of the risk process in order to allow the program to proceed as risks are realized.
- Leveraging Existing Program(s) of Record: In some cases, rapid acquisition programs are focused on rapidly extending an existing capability baseline. This may or may not involve additional development work, or it may only require integration and test activity. In these cases, the tailoring of the SETR process should consider the existing data/risks from the program(s) of record and should be factored in during SETR tailoring.

7. Events

7.1 Reviews

7.1.1 Initial Technical Review (ITR)

7.1.1.1 Purpose

Early reviews such as the ITR and ASR may include non-NAVAIR participants and contractors other than the system prime. Note: these types of SETR events should not have prospective contractors present without legal and contractual considerations in place, such as Non-Disclosure Agreements (NDA), in these early phases of the acquisition for non-Government participants. The purpose of the ITR is to gain an understanding of the need for a material solution to close a capability gap identified through the Joint Capabilities and Development System (JCIDS), Capabilities Based Assessment (CBA) and Concepts of Employment (CONEMP).

7.1.1.2 Timing

The ITR occurs prior to the Material Solution Analysis (MSA) phase of acquisition, following the CBA and Navy draft of the Initial Capabilities Documents (ICD), but prior to Gate 1 and the Material Development Decision (MDD) milestone. An ITR can occur immediately after CBA to provide a technical foundation to development of the Analysis of Alternatives (AoA) Guidance and begin work on AoA Scope and tasking. An ITR shall occur just prior to MDD to review the four elements required in interim Department of Defense Instruction (DODI) 5000.02 and establish work tasks for the MSA Phase.

7.1.1.3 Discussion

7.1.1.3.1 Focus

The ITR is the first formal engagement by the NAVAIR acquisition community on emerging requirements leading to an acquisition program. It is also designed to help inform AoA Guidance and AoA Scope and Tasking with the experience of the NAVAIR acquisition competency teams in areas of technology maturity, developmental resource requirements, and acquisition schedule metrics. ITR brings the emerging program lessons learned and experience honed at NAVAIR over the years fielding weapon systems.

One or more ITRs can be held prior to MDD to facilitate engagement between the future acquisition program team, the AoA analysis team, and OPNAV resource sponsors. An ITR is beneficial in preparing NAVAIR SYSCOM leadership to participate in the Department of the Navy (DON) Gate reviews or Office of the Secretary of Defense (OSD) Program Support Reviews.

To comply with Interim DODI 5000.02 requirements for MDD, an ITR should cover the following four topics:

- 1) The candidate material solution approaches have the potential to effectively address the capability gap(s), desired attributes, and associated dependencies.
- 2) There exists a range of technically feasible solutions generated from across the entire solution space, as demonstrated through early prototypes, models, or data.
- 3) Consideration has been given to near-term opportunities to provide a more rapid interim response to the capability need.
- 4) The adequacy of the plan to staff and fund analytic, engineering, and programmatic activities supports the proposed milestone entry requirements through MSA.

7.1.1.3.2 Unique Considerations

- The ITR is tailored to the amount of information available on the timeline to program initiation. Joint and external program dependencies can be unstable or undefined. Understanding dependencies and risks are the goal of the ITR.
- The ITR is designed to assess capability gaps, the current state of technology, and associated technical maturation necessary to fill the gaps.
- ITR assesses the feasibility of the operational urgency and achieving the desired Initial Operational Capability/Full Operational Capability (IOC/FOC) based on comparative analysis of previous, similar acquisition program performance.
- ITR sets the conditions to understand initial CONEMP, CONOPS, and Tactical Situations (TACSITS) prepared for the CBA and review traceability and align with Naval Mission Areas.
- ITR also assesses risk and applicability of Rough Order of Magnitude (ROM) costs for potential program development by leveraging past experience rather than being informed by industry pre-contract or pre-bid estimates. Special emphasis shall ensure proper resourcing for MSA Phase activity.
- ITR assesses technical foundation for AoA Guidance and candidate AoA Scope and Tasking.

7.1.1.4 Outcome

Completion of this review should provide:

- Agreement that the technical baseline is sufficiently rigorous to support a valid cost estimate.
- Agreement that the requisite research, development, test and evaluation, engineering, logistics, and programmatic bases for the program reflect the complete spectrum of technical challenges and risks for the capability needs and material solution approach of the proposed program.

7.1.2 Alternative System Review (ASR)

7.1.2.1 Purpose

The purpose of the ASR is to review the technical and programmatic plan to transition the Preferred Material Solution, chosen by leadership after the AoA, into an acquisition program with release of a TMRR phase RFP at MS A.

7.1.2.2 Timing

The ASR occurs during the MSA phase of acquisition following AoA completion. If the AoA is in response to a Joint Requirements Oversight Council (JROC) or Joint Capabilities Board (JCB) Initial Capabilities Documents (ICD), the appropriate Functional Capabilities Board (FCB) will review the AoA and recommended a preferred material solution along with any other MSA analysis. The FCB will also review the draft CDD to inform the AS and TMRR Phase RFPs. This review will be held to inform NAVAIR and DON leadership prior to this FCB review.

7.1.2.3 Discussion

7.1.2.3.1 Focus

The AoA will present a solution space of potential material solutions; this will provide leadership with a balanced evaluation of cost, schedule, performance, CONOPS, and risk. In parallel with the AoA, the fledgling program office is being established to support technical and programmatic planning for transition of the system selected by leadership into an acquisition program.

The ASR reviews the efforts to align the leadership-selected preferred material solution with the acquisition strategy being formed in the AS, Program Protection Plan (PPP), Test & Evaluation Master Plan (TEMP), SEP, draft CDD, CMP, and System Design Specification (SDS).

As part of the AoA, the capability gap was translated uniquely into MOEs and decomposed MOPs for each potential material solution. The ASR will review the translation of the MOPs into the draft CDD and capture these as KPPs.

Technical risk associated with maturing emerging technology will be evaluated to assess the mitigation outlined in the AS required to achieve Technology Readiness Level (TRL)-6 (TRL-6) by MS B.

Important considerations at this point of system development are the external dependencies and interfaces to the broader SoS in which the emerging program of record will need to operate. The placement of the preferred material solution within the service and joint SoS architecture to define external dependencies and interfaces is understood at ASR. This information is captured as part of the DODAF architecture and system interface documents. This defines the boundaries of the system about to enter procurement.

7.1.2.3.2 Unique Considerations

- Many potential material solutions may still be viable at the ASR timeframe. A technical assessment of the feasibility, and associated risk, of each candidate should be completed.

- The AoA Report may not be complete for ASR, but the AoA should be complete for the review.
- All of the acquisition documents are inter-related and are expected to change as more information is gained and risk is balanced proceeding into MS A.
- As the AoA winds down, operational control of activities will transition to the responsible PEO for the procurement.
- The appropriate security environment is in place at ASR to support MS A and the TMRR Phase.
- The ASR is a time-based event to assess the tasks and risks to complete a TMRR Phase RFP by MS A.

7.1.2.4 Outcome

Completion of this review should provide:

- 1) An agreement on the preferred system concept(s) to take forward into the TMRR acquisition phase;
- 2) A comprehensive definition and assessment of the initial Preferred System Concept(s) to ensure that capability objectives and operational requirements are defined in conjunction with the appropriate stakeholders. The Initial Capabilities Documents (ICD), AoA, Supportability Objectives and Concept, Preliminary Integrated Architecture and Best Material Approach(es) are supported by thorough Modeling & Simulation (M&S) and were subjected to rigorous warfare analysis;
- 3) A review of the draft CDD, SDS Draft Performance Baseline Preliminary System Specification, T&E Strategy, and Technology implementation plan;
- 4) A comprehensive rationale for preferred system concept solution, which includes an AoA evaluating relative cost/schedule/performance (hardware, human, software)/process integration/technology risks;
- 5) A comprehensive assessment on the relative risks associated with including Commercial Off-the-Shelf (COTS) or Non-Developmental Items (NDI) as opposed to a new design, with emphasis on host platform environmental design, diagnostic information integration, dependence on other Government programs and maintenance concept compatibility;
- 6) A comprehensive risk assessment for the TMRR acquisition phase;
- 7) Trade studies/technical demonstrations for concept risk reduction;
- 8) Joint requirements for the purposes of compatibility, interoperability, and integration;
- 9) Refine threshold and objectives initially stated as broad measures of effectiveness;
- 10) A comprehensive plan for the TMRR acquisition phase (hardware and software) that addresses critical components to be developed and demonstrated, their cost, and critical path drivers;
- 11) Initial planning for the EMD acquisition phase; and

- 12) Draft system requirements document if one does not already exist. (This is the highest-level document that includes key relationships among subsystems to be created by the project to represent the customer/user requirements.) This systems requirement document should include a system-level description of all software elements required by the preferred system concept.

7.1.3 System Requirements Review-I (SRR-I)

SRR-I is conducted to ensure that the Government has established performance requirements that are traceable to the CDD in an effort to measure system maturity prior to RFP release.

7.1.3.1 Purpose

The purpose of SRR-I is to ensure that the Government has established performance requirements and non-tailorable design, build, certification, and acceptance requirements that are directly traceable to the CDD. SRR-I assesses readiness and risks prior to RFP release.

7.1.3.2 Timing

The SRR-I is typically conducted after Gate 2. SRR-I may also serve as the final step in the Specification Review Board process administered by the APEO(E). The timing of the SRR should be coordinated with the Specification Review Board (SRB) conducted per NAVAIRINST 4120.9 (Preparation, Application, and Tailoring of Program Unique Specifications within the Naval Air Systems Command) to complete the specification approval process for RFP release. Adequate time should be allowed for critical RFAs to be closed prior to RFP release.

An additional system requirements review, SRR-II, will be conducted after MS A and contractors participating in the TMMR Phase have been selected.

7.1.3.3 Discussion

7.1.3.3.1 Focus

The SRR-I is a Government technical assessment of the requirements decomposition process performed to finalize the SDS performance baseline. This review ensures that the CDD, DoD Directives, statutory and regulatory guidance, design, build, acceptance and certification standards have been correctly and completely represented in the SDS, Statement of Objective/Work (SOO)/(SOW), AS, and RFP. This is accomplished through an acquisition program definition characterized in the system description, program cost, and schedule constraints.

SRR-I assesses that the performance requirements non-tailorable design, build, certification and acceptance requirements traceable to the CDD were translated into the technical specification and correctly capture derived and correlated requirements. Requirements shall have clear certification and acceptance criteria, and capability is achievable and verifiable through available technologies.

SRR-I examines the technical risk assessment that characterizes the understanding of achieving requirements represented in the SDS performance baseline and the technical risk mitigation

strategy captured in the Acquisition Strategy highlighting prototyping or demonstration strategies at the end of the TMRR phase prior to MS B. Additionally, SRR-I looks at the program execution risk assessment characterizing the ability to achieve the CDD-specified capabilities within program budget and schedule.

7.1.3.3.2 Unique Considerations

- Special consideration should be given to reviewing consistency across all acquisition documents.
- Consistent alignment between the specification, technical management plans (e.g., SEP, SSMP, CMP, TEMP), SOW, Sections L and M of the RFP should be reviewed.
- Requirements for artifacts to support future design reviews should be understood and specified.
- For software-only SRRs, AIR-4.1 may approve the appointment of the TRB Chairperson from the NAVAIR Software (AIR-4.9) organization.
- If the SRR is to support an ECP or subsystem, consistency with the established system architecture at the SDS-allocated baseline should be reviewed.
- Staffing levels based on one or multiple contractors going forward should be used in evaluating execution risks.

7.1.3.4 Outcome

Completion of this review should provide:

- 1) SDS performance baseline established.
- 2) SRR-I captures inputs from all NAVAIR Competencies and provides the technical basis for operational effectiveness and suitability system design, ensuring Government requirements are translated, decomposed, and verifiable by the prime contractor in preparation for the RFP.

7.1.4 System Requirements Review-II (SRR-II)

SRR-II is performed for each contractor after the award of TMRR Phase development contracts with the purpose of verifying that the contractor understands and properly translated the requirements into their technical documentation.

7.1.4.1 Purpose

The purpose of the SRR-II is to conduct a technical assessment of the developing Contractor System Specification, built from the SDS performance baseline, to ensure a reasonable expectation of providing an operationally effective and suitable final system.

7.1.4.2 Timing

The SRR-II is performed after the start of the TMRR, MS A and SRR-I to clarify that the contractor(s) understands the requirements. The SRR-II is typically conducted three to six months after multiple contractors have been engaged. SRR-I will have been conducted prior to this review to ensure threshold requirements are aligned to the draft CDD.

SRR-II is the initial technical review engaging contractors and sub-contractors teams to establish a baseline reference of threshold requirements, CONOPS for the proposed system, and areas of tailorable requirements for further definition proceeding into PDR. This phase defines and documents the architecture for the system. SRR-II should not be scheduled at a particular number of months after contract award; rather, it should occur relative to the maturity of the system technical baseline as described above.

7.1.4.3 Discussion

7.1.4.3.1 Focus

The purpose of the SRR-II is to conduct a technical assessment of the developing contractor SDS requirements baseline, built from and traceable to, the SDS performance baseline, to ensure a reasonable expectation of providing an operationally effective and suitable final system. At SRR-II, the TRL of system elements should be assessed at a level of at least TRL-5 and the Manufacturing Readiness Level (MRL) should be assessed at a level of at least MRL-5. The minimum TRL/MRL considered acceptable at SRR-II, or any other SETR event, is ultimately a PM decision based on the level of risk acceptable to the program. The risk of lower TRL/MRL values may be mitigated by effective and resourced maturation plans.

Tailorable, non-tailorable, derived, and correlated requirements are established within the framework of a candidate physical architecture and documented in the SDS requirements baseline. At SRR-II, the SDS requirements baseline is reviewed to ensure the contractor understands what requirements have been allocated to them for further decomposition, or that they have appropriately decomposed the performance requirements to the scope of the effort under contract. In order to support higher-level requirements definition a candidate functional architecture is used. The candidate functional architecture is documented to support a complete understanding of the specific design, cost, and schedule balancing of tailorable requirements and functional decomposition in the next phase of development. A technical risk assessment is executed to characterize the understanding of requirements and verification procedures, representing the ability of the contractor to comply with the SDS performance baseline. A program execution risk assessment characterizes the ability to achieve the CDD-specified capabilities within program budget and schedule.

7.1.4.3.2 Unique Considerations

- For software-only SRR-IIs, AIR-4.1 still approves the appointment of the TRB Chairperson from the NAVAIR Software (AIR-4.1) organization.
- SRR-II should continue the upward traceability of requirements to the CDD established in SRR-I.
- The systems engineering process should look forward to the anticipated functional segments when reviewing the completeness of requirements.

- If this SRR is an ECP or subsystem modification to a larger weapon system at the prime contractor, the SRR reviews injection of ECP requirements into the larger system's allocated baseline.
- Resource requirements and timelines should reflect realistic staffing and review times for both Government and contractor personnel.

7.1.4.4 Outcome

Requirements baseline is established in the Contractor's baseline documentation and traceability to SDS performance baseline is established.

SRR-II captures inputs from the contractor to determine the technical basis for operational effectiveness and suitability. Ensuring Government requirements are translated, decomposed, and verifiable by the prime contractor is the major focus.

The review also captures the assessment of the prime contractor's ability to satisfy the system KPPs/KSAs, as well as complete external interfaces in the system of systems context. As the requirements are developed with the prime, the SRR-II Test and Evaluation (T&E) and certification review addresses verification and validation traceability and data requirements, as well as initial preparation of facilities and resources to execute a test program and obtain a flight clearance. SRR-II also reviews the status of the plans and processes necessary for controlling the development of the system to include cost estimating, risk management, information sharing, integrated scheduling and M&S.

7.1.5 System Functional Review (SFR)

7.1.5.1 Purpose

The purpose of SFR is to ensure that the system's SDS functional baseline is established and has a reasonable expectation of satisfying the requirements of the draft CDD. In a competitive environment when multiple SRR-II's are held, it is appropriate to hold multiple SFRs to ensure that each vendor's functional baseline has a reasonable expectation of meeting the CDD requirements.

7.1.5.2 Timing

The SFR is conducted during TMRR Phase between Gate 3 and Gate 4 following full system functional definition and completion of functional baseline documentation, and prior to preliminary design activity. The SFR should not be scheduled at a particular number of months after contract award; rather, SFR should occur relative to the maturity of the system technical baseline as described above.

7.1.5.3 Discussion

7.1.5.3.1 Focus

The SFR determines if the functional decomposition of the system performance requirements, lower-level performance requirements, and plans for design and development form a satisfactory

basis for preliminary design activities. The SFR is conducted before finalizing the CDD to ensure that the system's functional baseline is established and has a reasonable expectation of satisfying the requirements of the draft CDD. SFR is required as entrance criteria to Gate 4 in accordance with SECNAVINST 5000.2E. By SFR, the system TRL should be assessed at a level approaching TRL 6 and the MRL should be assessed at a level approaching MRL 6. The minimum TRL/MRL considered acceptable at SRR-II, or any other SETR event, is ultimately a PM decision based on the level of risk acceptable to the program. The risk of lower TRL/MRL values may be mitigated by effective and resourced maturation plans.

As a technical assessment to determine whether the system's functional definition is fully decomposed to its lowest level and if engineering teams are prepared to start preliminary design, the SFR is the first review that begins to allocate requirements to separate subsystems and organizational teams. As requirements are segregated into autonomous teams, an environment for focused analysis is created. Interface Control Documents (ICD) are required at SFR to ensure that the interfaces between subsystems are defined to facilitate coordination between the teams designing those subsystems.

A critical component of this review is the development of representative operational use cases for the system (or “Day-in-the-Life” analysis). System performance and the anticipated functional requirements are assigned to functional segments of subsystems, hardware, software, or support after the completion of a detailed analysis of the architecture and the environment in which it will be employed.

The product of SFR and associated analysis is known as the functional baseline. Functional segments may represent physical, organizational, or logical division of the product development within the contractor’s organization. These functional segments will begin managing the further decomposition of the system internally and system-level attributes externally through interface documents. The SFR is a focused evaluation of this functional allocation and a risk-based assessment of its ability to support further design derivation to be examined at the PDR.

7.1.5.3.2 Unique Considerations

- Functional requirements cover the breadth of design to include training, supply, logistics, test, and facilities. Functional segments should address this breadth
- Derivation of functions anticipates possible implementation in physical systems and is constrained by possible architectures, existing subsystem, and enabling system requirements
- Assignment to software or hardware may be premature, but is dependent on definition of functional segments

7.1.5.4 Outcome

The SDS functional baseline is established.

7.1.6 Software Specification Review (SSR)

7.1.6.1 Purpose

The purpose of SSR is to ensure that the system and functional requirements are allocated to detailed software requirements for software-intensive systems or software-only changes to a system. In a competitive environment when multiple SFRs are held, it is appropriate to hold multiple SSRs to ensure that each vendor's functional requirements have been allocated to their subordinate software requirements.

7.1.6.2 Timing

The SSR is conducted during the TMRR Phase after Computer Software Configuration Item (CSCI) requirements have been sufficiently defined to evaluate the contractor's interpretation of the system, subsystem, or prime item-level requirements from the SDS. Typically conducted in the second half of the TMRR phase, the SSR will occur between the SFR and the system PDR, following full system functional definition at SFR. The SSR should not be scheduled at a particular number of months after contract award; the SSR should occur relative to the maturity of the software requirements baseline as described above.

Scheduling the SFR, SSR, and PDR within a few months of each other severely constrains resources. Ideally, the SSR can be conducted as a buildup review to PDR. If SSR is conducted as a standalone review, consideration should be given to a reduced TRB focusing on software, with full TRB follow up at PDR. However, the PDR should ensure allocated consistency between software requirements in the SRR and supporting hardware requirements in the PDR.

SRR and SFR actions should be closed out prior to the SSR and Critical Technology Elements (CTE) should be matured. All acquisition documentation should be completed or updated prior to the SSR. If an incremental development approach is used on the acquisition program, then the acquisition documents only need to be completed for this increment. Any changes to the requirements since the SFR should be noted during the SSR.

7.1.6.3 Discussion

7.1.6.3.1 Focus

The SSR ensures that all system and functional requirements are allocated to detailed software requirements. The review assesses the finalized CSCI requirements and operational concept as captured in the product specifications. The Government's priority is to determine whether the System Requirements Specification (SRS), Interface Requirements Specification(s), and Operational Concept Document form a satisfactory basis for proceeding into preliminary software design. At SSR, a Software Test Plan (STP) is also drafted to support test facility scheduling and ensures availability of test resources and tools. All technical risks should be reduced to acceptable levels to ensure that the contractor(s) have the ability to deliver an attainable software solution that will meet the user's requirements prior to initiating the SSR. By SSR, the software should be assessed at a level approaching a software TRL-6.

This review is targeted for software-intensive systems or software-only changes to a system. Acquisition programs with an incremental development approach are required to conduct an SSR for each increment. The SSR baselines the Software Requirements Specification (SwRS) or Software Requirements Description (SwRD) before software design work commences. All contractor SwRSs and functional design solutions (SDS functional baseline) will be verified for traceability to a common SDS performance baseline. The content requirements of the SSR are prerequisites for the system PDR.

7.1.6.3.2 Unique Considerations

The assigned Software Lead should assist the SE with coordinating chairperson requirements with the cognizant APEO(E). Typically the SSR will be chaired by the Software Systems Engineering (4.9) competency.

The following SSR attendees should be added to the standard list of attendees for a review:

- 1) Software (AIR-4.9) Representative
- 2) Software Lead
- 3) System/Software Safety, who should ensure that all safety-critical requirements are identified and the System Safety Hazard Analysis is progressing
- 4) OPR/PMA Configuration Manager

The following items should be added to a standard review agenda and presented at an SSR:

- 1) Software risks
- 2) Software Life Cycle Support Concept
- 3) Changes to requirements or architecture since SFR
- 4) Detailed review of software requirements
- 5) Functional overview of each CSCI, including inputs, processing, and outputs of each function
- 6) Overall CSCI performance requirements, including those for execution time, storage requirements, and similar constraints
- 7) Architectural overview of system and CSCIs
- 8) Expected software criticality levels for each CSCI
- 9) Expected classification levels of CSCIs and declassification requirements
- 10) All interface requirements between the CSCI and all other CM earlier in the docs (CIs) both internal and external to the system
- 11) Test Verification Matrix that identifies applicable levels and methods of testing for the software requirements that comprise the CSCI
- 12) Any special delivery requirements for the CSCI
- 13) Mission requirements of the system and associated operational and support environments
- 14) Functions and characteristics of the computer system within the overall system
- 15) Status of facilities, tools, models, and simulations

- 16) Draft test plan
- 17) Software-specific CMP (if applicable)
- 18) Results of all incremental CM audits or assessments (if applicable)

7.1.6.4 Outcome

A Partial SDS-allocated baseline is established for allocated software functionality that becomes part of subsystem specifications.

7.1.7 Preliminary Design Review (PDR)

This section addresses the variants of PDR, PDR-I, and PDR-II. These reviews are different and therefore presented separately in this handbook.

Programs employing the traditional acquisition model will use the “PDR” variant. The use of the “PDR” variant is appropriate when there is no contractual break or acquisition MS decision immediately after PDR. This “PDR” variant fully engages subsystem contractors at SFR and is supported by their bottom-up reviews to culminate at a system-level PDR. The review will provide a complete definition of the allocated baseline after a single review.

The use of a “PDR-I” and “PDR-II” combination is appropriate when there is a contractual break, acquisition MS decision, or the Government is performing LSI responsibilities for the system under procurement.

PDR-I occurs at the completion of the TMRR phase prior to MS B to establish a preliminary allocated baseline. PDR-II occurs after MS B and the award of a contract. PDR-I has limited subsystem contractor involvement and will result in interface design standards between subsystems. It uses a top-down allocation of requirements. PDR-II is then performed after full engagement with subsystem contractors to provide a complete allocated baseline definition with bottom-up analysis of the subsystems. PDR-II acknowledges the work accomplished and unchanged from PDR-I that is contained in the traditional “PDR” variant checklist.

Entrance criteria and checklist questions for all three PDR variants are the same. Each checklist should be tailored to reflect the specific characteristics of that review (PDR-I, PDR-II, or PDR).

7.1.7.1 Purpose

The purpose of PDR is to evaluate the maturing design as documented in Hardware Configuration Items (HWCI) and CSCI that represent the first physical definition of the system. This design is captured in the SDS-allocated baseline.

7.1.7.2 Timing

PDR-I occurs at the end of TMRR phase prior to MS B.

PDR or PDR-II occurs after MS B at the beginning of the EMD phase.

This review occurs after completion of system functional decomposition, baselining of software requirements, preliminary detailed design, and interface definition. In the case of a software-intensive system, the SSR should have been completed. All system elements (hardware and

software) should be at a level of maturity commensurate with the PDR entrance criteria prior to conducting the review.

If the AS calls for limited contractor engagement prior to MS B, a PDR-I would be held just prior to MS B and a PDR-II would be held after MS B when subsystem contractors have been engaged and developed the subsystem allocated baselines. Timing for PDR-II or a traditional PDR is benchmarked at readiness for detailed design in the system and subsystems. This occurs when bottom-up system-level analysis supports a reasonable technical risk evaluation of the allocated baseline.

7.1.7.3 Discussion

7.1.7.3.1 Focus – PDR-I

PDR-I is a technical assessment based on a top-down allocation of requirements to subsystems that will eventually represent the allocated baseline. The allocated baseline is then established after PDR-II.

This review is appropriate when there is a contractual break, acquisition MS decision, or the Government is performing LSI responsibilities for the system under procurement. PDR-I has not yet fully engaged contractor personnel for a bottom-up analysis to support system-level analysis as in a traditional PDR. However, this review represents a physically architected system based on engagement of subsystem suppliers and knowledge gained through prototyping CTEs identified in the AS. Subsystem Technical Performance Measurements (TPM) have been established through top-down allocation, but have not been verified through bottom-up analysis, which has been deferred to PDR-II. Since only top-down analysis has been accomplished, this baseline is usually characterized by Interface Design Documents (IDD) between subsystems versus more specific Interface Control Documents (ICD) supported by subsystem design reviews.

System-level analysis is performed to evaluate the breadth of the design. Subsystem requirements are evaluated to determine whether they correctly and completely satisfy all system requirements, and confirm traceability of subsystem requirements to the system design. The PDR-I is performed to evaluate the maturing design as documented in HWCIs and CSCIs, which represent the first physical definition of the system.

The review ensures that the physical properties of the system have been properly allocated to subsystems and components in agreement with acceptable design growth margins and analysis. Each function in the functional baseline shall be allocated to one or more system configuration items. This review is to ensure that the system under review has a reasonable expectation of being judged operationally effective and suitable in preparation for MS B.

An assessment of the limited detailed design for CTEs and critical design areas is also performed at PDR-I to ensure that there is adequate detail in the system architecture. The assessment of the CTE maturity can be supported by critical element prototyping and demonstration, although prototyping may be used for any risk mitigation purpose. These prototypes or demonstrations

should be used to close information gaps in the technical analysis or to reduce technical risk going forward in order to support higher-level systems analysis. They also support an understanding of engineering design margins and system sensitivity entering detailed design.

7.1.7.3.2 Focus – PDR/PDR-II

The PDR or PDR-II is a technical assessment held to ensure that each function in the functional baseline has been allocated to one or more system configuration items. This review establishes the SDS-allocated baseline for the system. The review is performed to evaluate the maturing design characterized by HWCI and CSCI as the first physical definition of the system. A successful PDR will inform requirements trades; improve cost estimation; and identify remaining design, integration, and manufacturing risks.

PDR or PDR-II ensures that the physical properties of the system have been properly allocated to subsystems and components in agreement with acceptable design growth margins and analysis. An assessment of the allocated design captured in subsystem and component product specifications for each configuration item in the system is performed. System maturity at PDR/PDR-II exhibits:

- An architected hardware/software system,
- Preliminary detailed design by subsystem suppliers,
- Critical technologies matured to at least a TRL-6, and
- Manufacturing technologies and processes matured to at least a MRL-6.

PDR or PDR-II is supported by bottom-up analysis beginning with subsystem maturity. The entire system is reviewed at the SDS-allocated baseline level, which requires subsystems to substantiate, through analysis or prototyping, the ability to support the system-level TPMs allocated through top-down analysis. If a PDR-I was held, this allocation was reviewed, but not supported with complete subsystem analysis at the allocated baseline level. This review, whether conducted as a full PDR or a PDR-II, invokes the bottom-up analysis to establish a complete understanding of technical risk proceeding into detailed design.

If CTEs were being matured during system architecting, prototyping or analysis should show a reasonable level of risk for these CTEs to support their allocated TPMs. If CTEs do not mature adequately during detailed design, rebalancing of system performance will ripple throughout the entire design. This may result in cost-prohibitive redesign and/or acceptance of lower performance for the entire system. Subsystem specifications for hardware and software, along with associated Interface Control Documents (ICD), enable detailed design or procurement of subsystems. The SEP and AS should provide benchmarking guidance at PDR/PDR-II for CTEs.

7.1.7.3.3 Unique Considerations – PDR-I

- Subsystem build-up review should still be held, but allocated performance is evaluated parametrically with margins versus bottom-up analysis.

- If PDR-I is part of a MS B decision to choose a single contractor, other acquisition considerations become part of the review.
- Special consideration should be taken if this preliminary SDS-allocated baseline becomes a MS B contractual specification.

7.1.7.3.4 Unique Considerations – PDR/PDR-II

- Additional tailoring may be prudent if a PDR-I was conducted to reduce the workload for a PDR-II.
- If a PDR-I was conducted, the SDS-allocated baseline may have been adjusted by the supporting bottom-up analysis.
- A System Requirements Analysis (SRA) following AIR-4.2 guidelines should be included in each subsystem PDR.
- An SSR should have been completed prior to PDR with allocated software requirements and software Interface Control Documents (ICD) reviewed for all subsystems.
- APM(T&E) should ensure that all test requirements are addressed.
- Representatives from all certification authorities should attend the review and ensure allocation of test requirements to subsystems.

7.1.7.4 Outcome

SDS-allocated baseline is established.

7.1.8 Release Backlog Review (RBR)

NOTE: This review is to be used with Agile Development only.

7.1.8.1 Purpose

The purpose of RBR is to:

- 1) Assess maturity of release
 - 2) Assess the backlog allocated to Sprints and Releases delivery
 - 3) Ensure the system integration plan is complete for the release to:
- Gauge execution progress of sprints and the current release
 - Gauge release capabilities in satisfying system KPPs
 - Assure synchronization of all sprint teams
 - Assess impact of new requirements and/or reallocating requirements from one release to another on overall system development
 - Assure that release timing is appropriate to maximize integration and test (I&T) effectiveness
 - Understand the scope of systems integration including number of integration points (and their complexity) along with their order of execution
 - Review plans for current and future releases (which will go to I&T only, which may be released to the end user)

7.1.8.2 Timing

The RBR is conducted repeatedly during the EMD phase after a number of sprints or tied to a projected release of software, as determined by the program. Sprint length can vary, but is nominally from two to four weeks. It's expected that an RBR will be held at least every three months. The first RBR will occur after PDR. RBRs will be held until the completion of the last release when a system-level product baseline (initial) is established prior to TRR.

7.1.8.3 Discussion

A tentative allocated baseline is established at PDR. The execution of the sprints will incrementally build the software capability until a new incremental product baseline (initial) is established at the incremental CDR. User stories that are not accepted will either be kept open until the corrections are implemented and accepted or defined as rework that needs to be incorporated back into the backlog as new user stories. Rework coupled to new/changed/deleted requirements once incorporated into the backlog will become the new allocated baseline to be reviewed at each RBR. Backlog re-prioritization requires joint (Government and contractor) concurrence.

The release software capability will be judged by 1) actual delivered user stories compared to the planned user stories for the release that are accepted and 2) the number of integration points that are able to be executed upon its delivery to integration.

7.1.8.3.1 Focus

The RBR ensures that the all user stories in the backlog are assigned to a sprint, either completed or scheduled. The review also assesses the management of the backlog, which is the main focus in Agile software development. In this regard, the following are verified:

- 1) Every user story is assigned to a sprint.
- 2) Releases and release functionality are identified.
- 3) All sprint teams are synchronized with respect to the backlog.
- 4) New requirements are appropriately factored into the backlog.
- 5) There is traceability between release functionality and KPPs.
- 6) Credit is taken for verification and validation, with the possibility of laboratory testing reducing the time required for system DT period.
- 7) Releases are occurring at logical intervals.

7.1.8.3.2 Unique Considerations

The assigned Software Lead should assist the SE with coordinating chairperson requirements with the cognizant APEO(E). Typically the RBR will be chaired by the Systems Engineering or the Software Systems Engineering (4.9) competencies.

The following RBR attendees should be added to the standard list of attendees for a review:

- 1) Systems Engineering (AIR 4.1) Representative
- 2) Software (AIR-4.9.4) Representative

- 3) System Safety Lead
- 4) Test Team Lead
- 5) Human Factors
- 6) CM

The following items should be part of the standard review agenda and presented at an RBR:

- 1) Backlog list (user stories), current allocation to each sprint and release.
- 2) Annotated changes to the backlog list, i.e., sprint and release previously assigned to, which ones were modified/added/deleted since the previous RBR.
- 3) Sprint teams (or supplier teams) and their synchronization mechanism process/status.
- 4) Traceability, release functionality to system KPP.
- 5) Software test progress, i.e., all Sprint testing within release, and results.
- 6) Update of the User Story Rework Status Table (see Figure 4).
- 7) Update of Agile metrics.
- 8) Systems Integration planning.
- 9) Laboratory simulation/stimulation updates.
- 10) Updates to laboratory toolsets for data requirements.
- 11) Developer CM processes to ensure accurate tracking of changes is maintained as requirements are reallocated to/from sprints.

User stories	Sprint team #1	Sprint team #2	Sprint team #3	Sprint team #n	Release 1			Release 2				Release 3	
					Sprint 1	Sprint 2	Sprint 3	Sprint 4	Sprint 5	Sprint 6	Sprint 7	Sprint 8	Sprint 9
Story #1	x	x	x										
Story #2	x	x	x										
Story #3	x	x	x										
Story #4	x	x	x										
Story #5	x	x	x										
Story #6	x	x	x										
Story #7	x	x	x										
Story #8	x	x	x										
Story #9	x	x	x										
Story #10	x	x	x										
Story #11	x	x	x	x									
Story #12	x	x	x										
Story #13	x			x									
Story #n				x									
Rework status	<div> <div>Demonstrated and accepted with no additional work added to backlog</div> <div>Demonstrated and accepted with additional work added to backlog for a future release</div> <div>Demonstrated and not accepted with additional work added to backlog for current release</div> </div>												

Figure 4. Notional User Story Rework Status Table

7.1.8.4 Outcome

With Agile development, the contractor does not typically produce formal documentation until all sprints have been completed. These RBRs mitigate the risk associated with limited formal documentation from Agile development by providing the Government with frequent and periodic opportunities to formally review the progress of developing software to implement the requirements. RBRs are initiated following SFR. The RBR should use requirements, design and test evidence accumulated across multiple sprints. Not until the last RBR will a complete set of software CDRLs (requirements, design and test) be available, which means that the Government needs to be involved in the Agile sprints and RBRs to ensure the correct system is being developed and to understand the impacts of shifts and additions of user stories to the backlog.

Completion of this review should provide:

- An assessment of the maturity of the actual release software capability (achieved vice planned capability).
- A baseline of the existing requirements backlog.
- Agreement that the release is ready for the next phase of development and usually the next level of integration or test.

7.1.9 Critical Design Review (CDR)

7.1.9.1 Purpose

The purpose of CDR is to evaluate compliance with the performance, design, build, acceptance, and certification requirements of the SDS product baseline as informed by detailed design and a component-level definition of the system. This definition is captured in the SDS product baseline. At CDR, this is referred to as the product baseline (initial), pending completion of the PCA, which validates the complete implementation of the product baseline, at which time it becomes the product baseline (final).

7.1.9.2 Timing

The CDR initiates the Manufacturing Development portion of the EMD acquisition phase. The CDR should be held when sufficient manufacturing development has been completed to facilitate low-risk, successful transition into production. Risk is contained when it is expected that any design changes that may be needed can be limited to the lower levels of subsystem design and can be captured in the design with little ripple effect across the design. While, ideally, no design changes will be needed after CDR, the reality is that the need for changes is often discovered during integration and testing. Component-level technical risk that may ripple across subsystems will generate significant resource impacts.

CDR occurs after completion of final design efforts and documentation to support the product baseline (initial), and prior to system fabrication and testing. Contractual requirements (e.g., an IMS that schedules a CDR a particular number of months after contract award) determine the need for technical backwards planning to ensure that the activities necessary to substantiate the product baseline (initial) are defined and resourced appropriately. CDR should only occur when the maturity of the system technical baseline has been established as defined above.

7.1.9.3 Discussion

7.1.9.3.1 Focus

CDR evaluates compliance with the performance, design, build, acceptance, and certification requirements of the SDS product baseline (initial) as informed by detailed design and a component-level definition of the system.

Analysis, prototyping, and modeling are more refined than previous reviews, and the depth of the design supports extending analysis to the component, code, and board levels. This level of design

further the analysis of the subsystem TPM compliance conducted at PDR with detailed internal definitions of the subsystems. Each HWCI and CSCI should demonstrate compliance with the allocated performance established at PDR or a rebalanced allocation that occurred during detailed design. The subsystem analysis is then integrated through system-level analysis to demonstrate that the product baseline (initial) has a reasonable expectation of meeting the specification. Analysis of system-level attributes such as safety, security, maintainability, supportability, and interoperability are executed with much greater fidelity at the lower levels than the analysis completed for PDR.

Full traceability should exist in the technical documentation from each top-level requirement to the software code or hardware components of the design at CDR. TRLs should be assessed to at least a TRL-7 and MRLs should be assessed to at least a MRL-7. The system maturity expected at CDR is comprehensive and detailed in order to establish the product baseline (initial).

7.1.9.3.2 Unique Considerations

- At CDR, organizational and contractual structures frame the impact of technical risk. Interface Control Documents (ICD) should be finalized and stable with acceptable margins to isolate the impact of design changes.
- Schedule risk assessments following AIR-4.2 guidelines should be included in each subsystem CDR.
- The APM(T&E) should ensure that all test requirements are addressed.
- Representatives from all certification authorities should review acceptability and critical path to certification.
- The APML should include a detailed review of logistics elements for the total system, subsystem, and support systems:
 - Design Overview
 - Requirements Trace and Completeness
 - Allocated Logistics Elements
 - Test and Certification Requirements
 - Maintainability Analysis
- Approval and design certification of changes to support manufacturing or production should be reviewed and captured in the CM system.
- Subsystem CDRs and incremental (i.e., subsystem) CM Audits should be conducted prior to the CDR to mitigate risk and to support the establishment of the CM baselines for the Product Baseline (initial).

7.1.9.4 Outcome

- SDS product baseline (initial) is established.

7.1.10 Integration Readiness Review (IRR)

7.1.10.1 Purpose

The purpose of IRR is to assess the status of the product, and supporting processes, to ensure that hardware and software are ready to begin integration and testing as an integrated CI. The IRR establishes the configuration to be integrated/tested and verifies that the developer is ready to begin CI or subsystem integration testing in the laboratory, e.g., test procedures are complete, based on the approved test plan, and traceable to requirements; unit-level testing is complete; adequate resources are available. In addition, IRRs may be incremental.

7.1.10.2 Timing

The IRR occurs during the EMD Phase upon completion of CDR.

The IRR is typically conducted during the Engineering Design stage of the EMD phase. Like other technical reviews, the IRR should be event driven and should not be scheduled at a particular number of months after contract award. The IRR should occur relative to the readiness and maturity of the CSCI–under-test to begin the testing required to support the overall program T&E and Risk Management Plans (RMP).

The IRR is used for earlier testing to ensure readiness and maturity to enter subsequent test phases (test and flight readiness). IRR should be held after all facets of the CSCI have been tested and have been integrated together to form the CI. The results from this test period will be used to determine maturity of the integrated CSCIs at the systems-level testing.

7.1.10.3 Discussion

7.1.10.3.1 Focus

IRR is a software-related review conducted at the end of the development stage when unit testing is complete and before system-level integration and tests commence to determine if the developer is ready for CSCI or subsystem-level integration and testing. Changes in the product baseline (initial) as a result of CDR require additional investigation and analysis to determine software impacts and rework as needed.

The review is a product and process technical assessment to establish the configuration to be used in software integration tests. The IRR verifies the traceability of planned tests to program, engineering data, analysis, and certification requirements. For systems where there are numerous CSCIs or those where individual CSCIs progress at different rates, there may be multiple IRRs.

A significant objective of this review is to ensure that the system is ready for test and that the integrated test facilities, such as Systems Integration Labs (SIL), are ready to test the system. Both system and SILs require management, readiness, configuration control, and support to yield successful and actionable test results. The establishment of the integration test configuration is accomplished through assessing system readiness based on the results of subsystem or CI tests, as well as the test infrastructure and planning adequacy. From this effort, the Test Verification

Matrix should be complete and a list of anomalies, limitations, and vulnerabilities should be compiled.

7.1.10.3.2 Unique Considerations

- For an IRR, an AIR 4.1 TRB chairperson appointment request should be coordinated by the assigned the SE or the Software Lead with the cognizant APEO(E).
- The program's T&E Lead may serve as a co-chairperson of the IRR.
- Subsystem IRRs and incremental (i.e., subsystem) CM Audits should be conducted prior to the IRR to mitigate risk.
- If the IRR is for a CSCI, the TRB chairperson should be assigned by the NAVAIR Software Organization within AIR-4.9 and the co-chairperson may be the program's Software Lead.
- The following IRR attendees should be added to the standard list of attendees for a review:
 - 1) System or Software Safety, who should ensure that all safety-critical requirements are identified and the System Safety Hazard Analysis is complete;
 - 2) Software (AIR-4.9) Representative; and
 - 3) T&E Lead.
- The following items should be added to a standard review agenda and presented at an IRR:
 - 1) Software, including Measurement Data (Metrics)
 - 2) Test Program Overview
 - 3) Test Schedule
 - 4) Test Verification Matrix
 - 5) Laboratory Configuration
 - 6) Models and Simulation Accreditation/Certification Results, as required
 - 7) Test Anomaly Reporting
 - 8) Test Program Staffing:
 - Organization structure/chart
 - Key acquirer/developer interfaces
 - Roles and Responsibilities
- Unit-level Test Results:
 - 1) Identify any preliminary testing that has already been conducted and their results
 - 2) Identify any outstanding discrepancies as a result of any preliminary/informal testing previously conducted and risk to test program
- Test Requirements:
 - 1) Required test resources (personnel, facilities, test environment, and test assets)

- 2) Final reporting process/format defined
 - 3) Fall back plan for technical issues and showstoppers
 - 4) Design changes during implementation
 - 5) Recommendation on Readiness to Commence Integration Testing
- CM of SILs or Hardware-in-the-Loop testing facilities should be reviewed and understood.
 - 1) A CM Assessment of the SIL can be conducted to meet this requirement.

7.1.10.4 Outcome

Completion of this review should provide:

- Agreement that:
 - Component/Subsystem test and/or validation procedures are complete and unit-level testing is complete.
 - Planned testing is based upon the test plan started in the requirements phase and completed during design phase.
 - The developer is ready to begin CI or subsystem integration testing in the laboratory.
- Agreement that hardware and software are ready to begin integrated testing with a reasonable expectation of success.

7.1.11 Test Readiness Review (TRR)

7.1.11.1 Purpose

The purpose of TRR is to assess the readiness of the product and the test objectives, processes, documentation, facilities, etc., to determine if the subsystem, system, or SoS and the testing organization are ready to commence testing.

7.1.11.2 Timing

The TRR is typically conducted during the I&E stage of the EMD acquisition phase. The TRR should occur relative to the maturity of the system under test to begin the subsystem, system, or systems of systems-level DT required to support the overall program T&E and RMPs. The TRR may be used for earlier testing to ensure readiness and maturity to enter any test phase.

7.1.11.3 Discussion

7.1.11.3.1 Focus

The TRR assesses the system's readiness to proceed to integrated testing. It leverages integrated system testing and ensures that the items planned for system-level tests have a stable configuration, identified test resources, and assurance that the contractor is prepared for formal testing.

During the TRR, the technical team may also review the results of informal testing and any updates to the operation and support documentation. TRR can be used prior to any test in any phase, but the review is specifically to be conducted prior to, and in support of, system-level developmental tests.

TRR is accomplished by evaluating test procedures for compliance with test plans and descriptions, and for adequacy in accomplishing test requirements. The TRR verifies traceability to program, engineering, analysis, and certification requirements. From this assessment, a list of anomalies, limitations, and vulnerabilities should be compiled for risk management. Requirements and procedures for test data should be assessed to ensure that the correct testing is taking place to verify (via MOPs), traceable to system MOEs and Measures of Suitability (MOS), and appropriate for the analysis needed to verify system requirements. A risk assessment needs to address program impacts if initiating tests with configurations different than those stipulated in the AS and TEMP.

7.1.11.3.2 Unique Considerations

- For a TRR, it is appropriate to include a senior AIR-5.1-designated person to serve as a co-chairperson.
- Subsystem TRRs and incremental (i.e., subsystem) CM Audits should be conducted prior to the TRR to mitigate risk.
- The following should be added to the standard review agenda:
 - 1) Measurement Data (Metrics)
 - 2) Test Program Overview, including the test schedule
 - 3) Test Program Staffing:
 - (a) Organization structure/chart
 - (b) Key Government/contractor interfaces
 - 4) Test Data Collection and Dissemination Plan (to include access to integrated data environments)
- TRR should address any preliminary/IRR/informal test results:
 - 1) Identify any preliminary testing that has already been conducted.
 - 2) Identify any outstanding discrepancies as a result of any preliminary/informal testing previously conducted.
- At a minimum, TRR should address required test resources (personnel, facilities, test environment, and test assets).
- The final test reporting process/format should be defined at TRR.
- A recommendation on readiness to commence testing and a mitigation plan for addressing technical issues and obstacles during tests should be presented.

7.1.11.4 Outcome

Completion of this review should provide agreement that:

- The subsystem or system under review is ready to proceed into formal testing.
- Test objectives/plans, test procedures/methods, scope of tests, safety and required test resources have been properly identified and coordinated to support planned tests.
- Planned tests are traceable to program requirements and user needs.

7.1.12 Flight Readiness Review (FRR)

7.1.12.1 Purpose

The purpose of FRR is to establish each configuration intended to be used in flight tests.

7.1.12.2 Timing

FRR occurs in the EMD acquisition phase after CDR and TRR prior to the first flight of the system.

The FRR is typically conducted during the EMD acquisition phase, after completion of the CDR and TRR, and prior to convening an Executive Review Board (ERB). The ERB is an AIR-5.1 process as described in NAVAIRINST 3960.4 (Project Test Plan Policy and Guide for Testing Air Vehicles, Air Vehicle Weapons, and Air Vehicle Installed Systems), separate and distinct from the FRR, and is primarily focused on the flight test planning and flight test plan approval for the flight test program.

The SE should ensure that Technical Interchange Meetings (TIM) have taken place in each IPT prior to the FRR, and that outstanding actions are carried forward to the FRR. The IPT members are responsible for briefing their material to their respective competency leadership participating in the FRR. Each competency is responsible for ensuring that all appropriate areas are being covered by team members, reviewing background material, and receiving a brief from their competency team members prior to the FRR.

Scheduling of an FRR should be contingent upon:

- Ensuring entry criteria are met by the beginning of the FRR,
- Relative confidence of receiving flight test go-ahead from the chairperson(s), and
- First flight event is coordinated closely with the applicable PMA

7.1.12.3 Discussion

7.1.12.3.1 Focus

FRR is conducted prior to the first flight of any new air vehicle to ensure that the system and test environment under review can proceed into flight test with NAVAIR airworthiness standards met, objectives clearly stated, flight test data requirements clearly identified, and an acceptable RMP defined and approved. FRR is also conducted prior to the first flight for any major changes to hardware, software, envelope, or for objectives not covered in a previous FRR.

The review is a technical assessment establishing each configuration intended to be used in flight tests. For complex systems, an FRR should be conducted with an assessment of each subsystem or CI.

This is accomplished through an external review of the subsystem requirements, subsystem detail design, details and conclusions of peer reviews, laboratory testing, and Independent Review Teams (IRT) for the final detailed design.

7.1.12.3.2 Unique Considerations

- The designation of two chairpersons independent of the program team is typical for an FRR:
 - 1) A Chair from AIR-4.0, defaulting to AIR-4.1 unless specifically directed otherwise by senior leadership.
 - 2) A Chair from AIR-5.1.
- FRR Participants include the following:
 - 1) NAVAIR Airworthiness Officer (AIR-4.0) PM and technical representatives.
 - 2) Chief Test Engineer, Chief Test Pilot, and appropriate members of the flight test engineering team. Lead instrumentation engineer, System Safety (AIR-4.1.6), Program Security representative, Software (AIR-4.9) representative, Technical Warrant/Certificate Holders, Operational Testers (as appropriate), and User representatives.

Subsystem FRRs and incremental (i.e., subsystem) CM Audits should be conducted prior to the FRR to mitigate risk.

7.1.12.4 Outcome

Completion of this review should provide:

- Agreement that:
 - The aviation system is under configuration management
 - A flight clearance has been, or will be issued by the technical authority
 - Flight test plan(s) are approved
 - Discrepancy tracking and risk assessment processes are in place.
- Agreement that the program is ready to initiate/conduct flight tests or flight operations.

7.1.13 System Verification Review (SVR)

7.1.13.1 Purpose

The SVR is a multi-disciplined product and process assessment to ensure that the system under review can proceed into Low Rate Initial Production (LRIP) and Full Rate Production (FRP) within cost, (program budget), schedule (program schedule), risk, and other system constraints. Generally this review is an audit trail from CDR, and assesses that the system final product, as

evidenced in its production configuration, meets the functional requirements as derived from the CPD to the Functional, Allocated, and Product (initial) Baselines. The SVR establishes and verifies final product performance.

7.1.13.2 Timing

The SVR starts with an “audit” of the test results, and other verification activities such as analyses, against the verification requirements, and concludes with an assessment of any risk that may exist due to incomplete and/or unsatisfactory verification tests. The audit portion of the SVR may begin at CDR (or whenever verification test results become available) and continue until the completion of PRR. The SVR may be conducted concurrently with the FCA. Once the audit portion is completed, a review should be scheduled to assess a roll-up of the results including the risks associated with any incomplete or unsatisfactory verification activities.

7.1.13.3 Discussion

7.1.13.3.1 Focus

The SVR provides assurance that the system (or, in the case of an incremental approach, its components/subsystems) satisfy the performance requirements by ensuring all verification/test procedures have been completed against the Requirements Traceability Verification Matrix (RTVM) and assessing those results. Any deficiencies must be documented and assessed for any associated risk. As discussed above, it may be preferable to separate the “audit” portion of the SVR from the associated risk assessment. When test results are received over an extended period of time, this approach may reduce risk by identifying concerns earlier than if the program waits for one consolidated audit. The SVR should not be identifying new issues, rather the goal should be to confirm that the program is aware of any issues and has properly assessed and mitigated them.

The SVR may be combined with an FCA. Together, the FCA and SVR verify that the design complies with the functional baseline, and that it satisfies all performance requirements. These must be complete prior to the system-level PRR to ensure that the contractor will not simply commence manufacturing, but that they will produce a system that meets requirements.

7.1.13.3.2 Unique Considerations

- For an SVR, an AIR 4.1 TRB chairperson appointment request should be coordinated by the assigned SE. Based on the focus, AIR-5.1 participation is required. If the SVR is combined with an FCA, AIR-1.1.3 participation is also required.
- The program’s T&E Lead may serve as a co-chairperson of the SVR.
- Subsystem/incremental (i.e., subsystem) SVRs may be conducted prior to the system-level SVR to mitigate risk.
- The following SVR attendees should be added to the standard list of attendees for a review:

- 1) System or Software Safety, who should ensure that all safety-critical requirements are identified and the System Safety Hazard Analysis is complete;
 - 2) T&E Lead.
- The following items should be added to a standard review agenda and presented at an SVR:
 - 1) Software, including Measurement Data (Metrics)
 - 2) Test Program Overview
 - 3) Test Schedule
 - 4) Test Verification Matrix
 - 5) Laboratory Configuration
 - 6) M&S Accreditation/Certification Results, as required
 - 7) Test Anomaly Reporting
 - 8) Test Program Staffing:
 - Organization structure/chart
 - Key acquirer/developer interfaces
 - Roles and Responsibilities
 - Unit-level Test Results:
 - 1) Identify any preliminary testing that has already been conducted and their results.
 - 2) Identify any outstanding discrepancies as a result of any preliminary/informal testing previously conducted and risk to test program.

7.1.13.4 Outcome

- Agreement that all verification requirements (including tests, analyses, etc.) have been satisfactorily completed per the RTVM.
- Agreement that any verification activities that have not been completed satisfactorily have been assessed for the associated risk and that appropriate mitigation plans have been approved and resourced.

7.1.14 Production Readiness Review (PRR)

7.1.14.1 Purpose

The purpose of PRR is to provide a multi-disciplined technical assessment of whether the program is prepared for the production phase of acquisition. The assessment includes an evaluation of the system's maturity and the contractor's ability to manage the supply chain and manufacture the system. A PRR should be conducted after an FCA or incremental PCA has verified that the system's functional baseline satisfies all functional requirements to ensure that the system is ready to proceed into LRIP and/or FRP within program budget, program schedule, and other constraints. TRLs should be assessed at a minimum of TRL-7 for LRIP, TRL-8 for Full Rate Production and MRLs should be assessed at a minimum of MRL-8 prior to conducting

the MS C PRR (for entry into LRIP at MS C review), or MRL-9 prior to conducting a Full Rate PRR (to support the FRP Decision Review), as applicable.

PRR occurs after evaluating the product to determine if the system correctly and completely implements all system requirements and whether the traceability of final system requirements to the production system has been verified. The purpose of the PRR is to then verify the contractor's readiness to produce that system. To determine the readiness of the contractor to manufacture the system according to the specifications and approved/verified design, the manufacturing processes, quality system, and production planning (e.g., facilities, tooling and test equipment, capacity, personnel development and certification, process documentation, inventory management, supplier management, etc.) are assessed.

The PRR is a capstone SETR event encompassing the scope and results of the SV, FCA and verification of the SDS functional baseline, and any incremental PRRs, or other preparatory production inspections, assessments, and reviews. PRR planning should occur prior to the LRIP or production contract award to effectively capture the Government's role working with the prime to inspect and assess subcontractors and their vendors.

Manufacturing and Quality Engineering (AIR-4.1.9) is the technical authority for all incremental/final PRRs, and any other production inspections or assessments. These activities are hands-on in nature and typically must be conducted onsite at the prime contractor and/or associated sub-contractor facilities. Early production assessments and corresponding risk and mitigation plans follow the system development with the Government/prime team re-assessing production planning, facilities allocation, incorporation of producibility-oriented changes, identification and fabrication of tools/test equipment, long lead item acquisition, and other supply chain issues. Logistics, manufacturing processes, and quality maturity should consistently improve as items are assembled and tested to create CIs, subsystems, and ultimately the entire system. Engineering changes generated during the T&E phase need to address impacts to production. As such, the PRR examines the execution of the contracts in place and the relationship between contracts to develop the system.

7.1.14.2 Timing

PRR is the last technical review prior to MS C and FRP decision, when required by the PM or MDA. The PRR is typically conducted at the end of the EMD Phase and prior to the start of the Production and Deployment Phase to assess the completeness of the design process and the manufacturing and quality risks as a prelude to the program proceeding into LRIP and as required by the Program prior to FRP.

Incremental PRRs, production inspections, and assessments should be conducted on the prime contractor and on major subcontractors, as applicable, as stated in the contract. These incremental assessments should be conducted in an iterative manner based on component/subsystem maturity. When feasible, they can be conducted concurrently with other major program reviews, but should be initiated early, starting shortly after PDR in some cases.

These incremental production assessments should be used to identify and mitigate risks as the design progresses, and rolled up at the PRR conducted for the EMD phase completion.

A follow-on, tailored PRR or Production Assessment Review (PAR) may also be appropriate in the production phase for the prime contractor and major subcontractors for:

- Changes to design, materials, manufacturing processes, and facilities/equipment for the planned Production and Deployment that differ from the EMD phase, or changes during the Production and Deployment Phase.
- FRP decision.
- Production start-up after a significant shut-down period.
- Production start-up with a new contractor.
- Relocation of a manufacturing site.
- Unresolved risks from a previous PRR.

Additionally, after a long shutdown, a new drawing scrub/obsolescence assessment may be required.

7.1.14.3 Discussion

7.1.14.3.1 Focus

The PRR provides assurance that the Prime Contractor is ready to begin production. This review assesses all aspects of the contractor's supply chain management (e.g., the ability of suppliers to meet component specifications, volume demands, and to review their receipt and inspection processes), such as parts management, assembly processes, quality assurance, deficiency resolution processes, workflow, and worker training. The purpose of the PRR is to ensure the end item will be produced in compliance with the approved and verified design at the lowest possible cost given the current constraints.

PRRs, or similar assessments such as a PAR, may be conducted incrementally as the system design and manufacturing matures. The goal of the process is provide assurance at the MS C review that the Prime Contractor is ready to produce the required volume of LRIP assets at the agreed upon cost and schedule; and the required volume of FRP assets at the FRP Decision Review (FRPDR).

7.1.14.3.2 Unique Considerations

- Production Engineering and Planning
- Materials and Purchased Parts
- Industrial Resources
- Quality Assurance
- Engineering and Product Design
- Logistics
- Software

- Program Management
- Diminishing Manufacturing Sources and Material Shortages
- Production Plan:
 - 1) Production schedule
 - 2) Capacity/Resource Utilization
 - 3) Cost per unit
 - 4) Acceptance testing
 - 5) Software maintenance and measurement data
- Capability Production Document (CPD) and corresponding traceability from the Capability Development Document (CDD)
- CM, specifically configuration control
- Technical Readiness consistent with TRA
- Manufacturing readiness consistent with an AIR 4.1.9 approved plan of actions and milestones (POA&M) and/or MRA plan in the SEP, SEMP, and contract
- Risk and Mitigation Plan

7.1.14.4 Outcome

The PRR verifies the contractor is ready to enter production with manageable program risk. It is the last technical review prior to MS C and provides input to the MDA for the decision to enter LRIP at MS C and FRP at the subsequent FRP Decision.

7.2 Audits and Supporting Reviews

Audits are a methodical examination and review of data, documents, and physical material. Audits should be comprehensive, satisfactory, complete, and documented in their approach. Audit execution is typically outlined within the contract SOW and the current CMP.

7.2.1 Description

7.2.1.1 Types

There are two types of audits: FCA and PCA. These audits may be performed through an incremental approach leading to a final system-level audit, as appropriate for a program. The system-level FCA establishes the functional baseline and the system-level PCA establishes the product baseline (final). Incremental audits can support subsequent engineering technical reviews and program decision points. The CM process must maintain integrity between engineering documentation and production documentation for the audits to maintain relevance.

- 1) A configuration audit verifies that the configuration identification for each item, subsystem, and system is accurate, complete, and meets the specified requirements (i.e. verification). The CM process utilizes audit results to manage the technical aspects of the system. Audits incorporated as part of the CM process provide controls

on the data management process for the system. The results of a complete audit provide documentation to support future review decisions.

7.2.1.2 Expectations

The contract SOW defines the audit expectations and participation requirements between the Government, prime contractor, and subcontractors. Industry use of commercial standards, such as ANSI/EIA-649B, EIA-649-1, SAE AS9102 or First Article Inspections (FAI), may be considered for use as evidence to support the audit process. At each design baseline established by the SDS, the system is refined down to the component level. The contract needs to highlight the prime contractor actions for delivery of this documentation to the Government.

Like technical reviews, audits can generate an RFA and the process for closing out the RFAs should be included in the audit aspects of the CMP.

7.2.1.3 Timeline

The program approach for conducting these audits should be defined in the SEP. The audits may be structured as a series of incremental functional and product baseline audits that conclude with a system-level or capstone event. These audits are mapped as early as SRR-I, to ensure that the appropriate language regarding the audit process is in the corresponding prime to subcontractor contracts. Starting at SRR-I, the Government CMP should define the actions necessary to assess the prime's ability to evaluate the subcontractors' successful achievement of each CI's performance and desired capability as stated in the functional baseline. This includes CM of COTS, Government Off-the-Shelf (GOTS), and NDI items that have been identified as part of the design.

The IMS should clearly show the development, test, acceptance, and delivery of all subsystems and vendor-supplied parts to support structuring in-process audits for the FCA and PCA. The SE needs the ability to assess the technical baseline at any time in order to support design analysis, developmental tests, operational tests, flight clearances, and corresponding risk assessments.

7.2.1.4 Results

The FCA and PCA ensure that the system under development is defined, understood, and documented effectively prior to the system being released to the Fleet or for use outside of the test environment (DT or OT). The FCA and PCA should be completed, and any known incomplete and corresponding risk assessments documented with corrective mitigation plans prior to issuance of a flight clearance for non-test personnel. Although parts of the SETR process may be tailored significantly to support a rapid prototyping or express acquisition, the FCA and PCA serve as the benchmarks to analyze the functional/product baseline and corresponding technical information and to assess the risk of any incomplete documentation or process impacting the operational environment. Every CI, function, operational limit and maintenance action needs to be within a controlled CM system with an understood and accepted risk level prior to non-test personnel utilizing the asset.

The audit results verify that all hardware and software match the design and there is no loss in translation between prime and subcontractors. Integrated Data Environments (IDE), engineering tools, and acceptance procedures vary within industry, driving the need for an audit to scrutinize the system under development.

7.2.2 Functional Configuration Audit (FCA)

7.2.2.1 Purpose

An FCA is a formal examination of the functional characteristics of the system. The FCA should be conducted after CDR to verify that the system has achieved the requirements specified in its functional and allocated configuration documentation.

By verifying that the system and its associated CIs, including hardware and software CIs, are accurate, complete, and compatible, and the CIs have achieved the functional characteristics delineated in the SDS. The FCA is a critical element to support Flight Clearances. Simply stated, the audit ensures that the integrated subsystem design accurately reflects the SDS functional baseline. FCA results serve as inputs to both the CPD and the PRR. The contractor's SEMP and the current CMP should be required to define their implementation of the FCA process.

7.2.2.2 Timing

The capstone FCA is typically conducted at the closure of the EMD phase of acquisition and supports the PRR. The FCA should be conducted through incremental audits concurrent with other major program reviews when appropriate. These incremental audits should be conducted during the TMRR and EMD phases of acquisition to identify and mitigate risks as the design progresses with a final FCA conducted at the completion of EMD Phase. The FCA may be conducted in coordination with the SVR.

A benchmark for requisite system maturity for the FCA would be when component-level design drawings and manufacturing "build-to" drawings have been released to manufacturing to verify no high-risk production issues and to provide confidence that the transition to production will be low-risk.

7.2.2.3 Discussion

7.2.2.3.1 Focus

Conducted when the system is in its final configuration, the FCA ensures that all functional requirements have been met from the assembled HWCI/CSCI. A system verification of the SDS-allocated baseline must also be conducted. The approach to verify system requirements should be documented in the SEP and supported by the contractor's SEMP. Early attention to system verification planning and collaboration with the test community can provide the ability to track and manage verification test plans/data that are aligned with decomposition of requirements in the program requirements database tool (IDE).

System verification is performed through several informal events after FAI, acceptance, and subsequent developmental testing are complete for the component or subsystem in review.

Verification of components and subsystems is achieved through analysis of artifacts collected to confirm all SDS-allocated baseline requirements are satisfied in accordance with methods defined in the RTVM. A series of system verification events may be conducted, leading up to a capstone system verification event for the entire system, which provides inputs for the incremental and capstone FCAs.

The FCAs lead up to a capstone FCA for the entire system. Results from the system FCA are used to prepare for the PRR, providing evidence of technical design completeness, ability to execute program production, assessment of technical risks, and whether the current product baseline (initial) is sufficiently established.

7.2.2.3.2 Unique Considerations

- FCA requirements shall be included in the SOW tasking.
- The FCA plan should define the contractor's task to perform an FCA. This plan shall be fully integrated into the SEP, SEMP, and IMS.
- An assessment of the functional baseline applicable to software items should be delayed until after integration testing is complete.
- Personnel needs are based on the type and complexity of the item(s) being assessed; however, experts are normally required in the areas of:
 - 1) Engineering design
 - 2) CM
 - 3) Computer-aided design (CAD)/manufacturing
 - 4) Production
 - 5) Assembly
 - 6) Acceptance test processes
- The following unique items should be added to a standard technical review agenda and presented at the FCA out brief:
 - 1) CI verification results
 - 2) Incremental FCA results and findings
 - 3) FCA should specifically address (OT) and transition to production risks.
- Systems engineers should consider the use of the (FAI) commercial standard, ANSI/EIA-649B/649-1, SAE AS9102 within the SOW. In accordance with the plan, the FAIs and corresponding report could be used as evidence for the audits to support the FCA. The intent of the FAI is to provide objective evidence that appropriate engineering design and specification requirements for any system end item are properly understood, accounted for, verified, and documented. Use of FAIs should be delineated in the prime contractor's FCA Plan.

7.2.2.4 Outcome

Agreement that the actual performance of hardware/software CIs demonstrated during testing complies with design and interface requirements in the functional baseline. This is confirmed through test/analysis data, including software unit test results for the configuration item(s) under review, demonstrate the intended function or performance stated in its specification is met; for the overall system, this would be the system performance specification.

7.2.3 Physical Configuration Audit (PCA)

7.2.3.1 Purpose

The PCA validates that the physical system complies with the product baseline (initial) established at CDR and serves as a point in system development where the product baseline becomes final and the Government assumes CM ownership of the product baseline (final). The audit validates that the physical end item is representative of all system documentation from top-level requirements down to individual engineering drawings at the lowest levels, confirming the “As Built” configuration matches the “As Designed” configuration. The results of PCA support the Gate 6 and the FRP decision as stated in SECNAVINST 5000.2. PCA ensures that the data captured in various IDEs and tools is consolidated into one location and analysis of the technical data demonstrates sufficiency for production.

7.2.3.2 Timing

The PCA shall be held prior to OT&E and system validation and the FRP or Full Deployment (FD) Decision Review and operational use. PCA occurs after completion of FCA and PRR to conduct a production line review. A functional and product baseline (final) must be established and Government approved prior to final acceptance (DD 250) and delivery of the system to the operational forces. The PCA must be compatible with availability of items being reviewed as well as applicable information, personnel, test results, and completed RFAs. The supporting CDRL/DD Form 1423 or equivalent must also be scheduled to correspond with PCA timing.

The PCA(s) should be conducted on the prime contractor and on major subcontractors’ products, according to the contract. Incremental PCAs to support the PCA should be conducted on the system through configuration items during the production work effort to identify and mitigate risks as the manufacture progresses. A capstone PCA is conducted during the production/development phase prior to full rate production decision. The roll up of the incremental item, subsystem, system audits to support the PCA event will be reviewed during the capstone PCA chaired by the PM or a delegated member.

7.2.3.3 Discussion

7.2.3.3.1 Focus

A PCA should be conducted during planned control of the detail design for the item being acquired via the TDP and after the FCA. At that time, the item is complete and one can verify that the CI "as built" conforms to the technical documentation defining the CI.

This audit is also used to validate many of the supporting processes used by the contractor in the production of the item and to verify other elements of the item that may have been impacted and/or redesigned after completion of the FCA. The audit is a technical examination of a designated CI finalizing the product baseline. This audit confirms that the manufacturing processes, quality control system, measurement and test equipment, and training were adequately planned, followed, and controlled.

Accomplished to support programmatic and quality assurance activities, the PCA determines if the acceptance testing requirements prescribed by the documentation are adequate for acceptance of CI production units. The PCA includes a detailed audit of engineering drawings, specifications, technical data, tests utilized in production of CIs, and design documentation, listings, and operation and support documents for CSCIs. The PCA also audits released engineering documentation and quality control records to make sure the “as-built” or “as-coded” configuration is reflected by this documentation. For software, the product specification, IDD, Software Design Description (SDD) and CDD should be a part of the PCA.

After successful completion of the PCA, the Government will establish and then assume control of the product baseline (final) for those audited CIs. At this point, all subsequent changes are processed by formal engineering change action in accordance with an existing Government approved or Government CMP.

7.2.3.3.2 Unique Considerations

- PCA requirements should be included in the contract SOW.
- A specific PCA Plan should be required as a contract deliverable from the prime contractor and incorporated into the IMS.
- An assessment to support PCA applicable to software items may be delayed until after integration testing.
- Personnel needs are based on the type and complexity of the item(s) being reviewed in the PCA; however, experts are normally required in the areas of:
 - 1) Engineering design
 - 2) CM
 - 3) CAD/computer-aided manufacturing (CAM)
 - 4) Production and Quality
 - 5) Assembly
 - 6) Acceptance test processes
 - 7) Defense Contract Management Agency (DCMA) plant representatives should also be tasked to review and certify engineering release, configuration control and in-house product verification processes.
- The following minimum information should be recorded in the minutes for each drawing (and/or CAD presentation reviewed):

- 1) Drawing number/title (include revision letter)
 - 2) List of manufacturing instructions and/or CAM data (numbers with change letter/titles) associated with this drawing
 - 3) Discrepancies/comments
 - 4) A sample of part numbers reflected on the drawing, checked for compatibility with the Program Parts Selection List (PPSL), and that the proper parts are actually installed in the CI.
- At a minimum, the following inspections should be accomplished for each drawing (and/or CAD presentation) and latest associated manufacturing instructions (and/or CAM data):
 - 1) Drawing numbers match on both.
 - 2) List of materials match in both.
 - 3) Nomenclature descriptions, part numbers and serial number markings called out on the drawing (and/or CAD presentation) should be identified on the manufacturing instructions (and/or CAM data).
 - 4) Drawings (and/or CAD presentations) and associated manufacturing instructions (and/or CAM data) should be reviewed to ascertain that all approved changes have been incorporated into the CI.
 - 5) Release records should be checked to ensure that all drawings (and/or CAD presentations) reviewed are identified.
 - 6) The number of any drawings (and/or CAD presentations) containing more than five outstanding changes attached to the drawing should be recorded.
 - 7) The drawings (and/or CAD presentations) of a major assembly/black box of the HWCI should be checked for continuity from top drawing down to piece-part drawing. (If CAD presentations are used, then all “layers” should be turned “on” and accessible for inspection.)
 - 8) Ensure that approvals by the Government are present where required.
 - 9) The PPSL should be compared to the HWCI/engineering drawing package to ensure that only approved parts are listed (see MIL-HDBK-965).
 - At a minimum, the following actions should be performed by the assessment/PCA team on each CSCI being audited:
 - 1) Review all documents that will comprise the product specification for format and completeness.
 - 2) Review FCA minutes for recorded discrepancies and actions taken.
 - 3) Review the design descriptions for proper entries, symbols, labels, tags, references, and data descriptions.
 - 4) Examine actual CSCI delivery media (disks, tapes, etc.) to ensure conformance with the software requirements specifications.

- 5) Review all required operation and support documents for completeness, correctness, incorporation of comments made at TRR, and adequacy to operate and support the CSCIs. (Formal verification or acceptance of these manuals should be withheld until system testing to ensure that the procedural contents are correct.)
- 6) Examine the related documentation to ensure that the relationship of the CSCI to the parts, components or assemblies that store the executable forms of the CSCI is properly described:
 - For firmware, ensure that the information completely describes the requirements for installation of the CSCI into the programmable parts or assemblies and that this information describes the requirements for verification that the installation has been properly implemented.
 - Where follow-on acquisition of the firmware items is intended, ensure that the documentation has been accomplished to the level of detail necessary for the intended re-procurement.
 - Demonstrate that each CSCI can be regenerated to be compared to the actual CSCI delivery media to verify they are identical using deliverable or Government-owned support software.

7.2.3.4 Outcome

- Agreement that the actual, as built, configuration of the item being produced matches the related design documentation as specified in the contract.
- Agreement that the manufacturing/support processes, quality control system, measurement and test equipment, and training are adequately planned, tracked, and controlled.

7.2.4 In-Service Reviews (ISR)

7.2.4.1 Purpose

The ISR should be conducted after production and deployment to ensure that the system under review is operationally employed with well-understood and managed risk.

7.2.4.2 Timing

The ISR is typically conducted prior to, and in support of, the initiation of the following Fiscal Year (FY) Operation and Maintenance, Navy (O&M,N) requirements determination process. Since the O&M,N requirements data calls typically occur in early second quarter timeframe of any given FY, the ISR should be conducted in the months prior.

7.2.4.3 Discussion

7.2.4.3.1 Focus

The review is a product and process assessment to characterize in-service technical and operational health of the deployed system by providing an assessment of risks, readiness,

technical status, and trends in a measurable form that will substantiate in-service support budget priorities. This is achieved through grouping in-service safety and readiness issues by priority to form an integrated picture of in-service health, operational system risks, system readiness, and future in-service support requirements. An analysis of the status of current system problem (discrepancy) report inflow, resolution rate, and trends and updated metrics is performed for prioritizing budget requirements.

7.2.4.3.2 Unique Considerations

- For ISR, an FST Leader should be added to the standard list of attendees.
- For ISR, the following should be added to the standard agenda for a technical review:
- Program Overview:
 - 1) Production Overview and Status
 - 2) Fielded Status
 - 3) Modification Program Status
 - 4) Engineering and Logistics Overview
 - 5) Program Staffing Status
 - 6) Budget Overview
- Program Risk Assessment:
 - 1) Operational System Hazard Risk Assessment status, including risks and mitigation plans
 - 2) Risk items and mitigation options
 - 3) Cost and schedule impacts of risk and/or mitigation options
- In-Service Management Metrics:
 - 1) Safety Program status
 - 2) Aging Aircraft status
 - 3) Naval Aviation Maintenance Discrepancy Reporting Program (NAMDRP) Program status
 - 4) CM Program status
 - 5) Software Program status
 - 6) Operational Advisory Group (OAG) status
 - 7) Readiness and Maintenance status
 - 8) Integrated Logistic Support Management Team (ILSMT) status
 - 9) Funding status
 - 10) ISR Action Items status
- Process Review (Provide Status of following to ensure that plans and processes are current):
 - 1) Program Management Plan (PMP)

- 2) Operational Requirements Management Plan
 - 3) System Safety Management Plan (SSMP)
 - 4) RMP
 - 5) CM Plan
 - 6) Naval Aviation Readiness Integrated Improvement Program (NAVRIIP)
 - 7) Reliability Centered Maintenance (RCM) and Integrated Maintenance Program (IMP) Plans
- Summary report due within 20 days of review.

7.2.4.4 Outcome

- Agreement that the system under review is operationally employed with well-understood and managed risk.
- An assessment of the in-service health of the deployed system, including an assessment of risk, readiness, technical status, and measurable trends to substantiate in-service support budget priorities.

7.2.5 Technology Readiness Assessment (TRA)

7.2.5.1 Purpose

A TRA is a systematic, metrics-based process that assesses the maturity of, and the risk associated with, critical technologies to be used in MDAPs. The TRA is the responsibility of the PM but it is typically led by the SE, with the assistance of an independent team of technical SMEs.

There are two fundamental purposes of the TRA. The first purpose is to provide the PM with a comprehensive assessment of technical risk. The second purpose of a TRA is to support the Assistant Secretary of Defense for Research and Engineering [ASD(R&E)]'s independent assessment of the risk associated with the technologies incorporated in the program. This evaluates if those technologies have been demonstrated in a relevant environment so that the MDA is informed as to if certification under *10 U.S.C. §2366b* can be accomplished, if a waiver is appropriate, and if risk-mitigation plans are adequate. The maturity of the technology in a relevant environment is characterized by the use of Software/Hardware TRLs, which are defined in NAVAIRINST 3910.1.

7.2.5.2 Timing

TRAs that must be submitted to ASD(R&E) are required only for MDAPs that require certification under 10 U.S.C. §2366b or other provisions of law, or when otherwise directed by the MDA. A TRA for each MDAP is required prior to MS B (or prior to MS C if the program entered the acquisition process after MS B, or when otherwise directed by the MDA). It provides input to the MDA to assist in the determining whether the critical technologies of the program have acceptable levels of risk—based in part on the degree to which they have been

demonstrated in a relevant environment—and to support risk-mitigation plans prepared by the PM.

The TRA plan should be written, approved by the PEO and CAE, and provided to ASD(R&E) early, typically after MS A. The plan should include a schedule that aligns with the AS and should be incorporated into the program's IMS. A preliminary TRA is required by Statute for the Development RFP Release Decision Point. The ASD(R&E) will conduct an independent review of the TRA factors to determine whether the technology in the program has been demonstrated in a relevant environment. The TRA will be provided 30 days prior to the pre-MS B Defense Acquisition Board (DAB) and will inform the certification decision at MS B in accordance with 10 U.S.C. 2366b. The TRA should be finalized after PDR and at least 30 days before MS B. For MDAPS, the final TRA report must be submitted to ASD(R&E) for independent review as required by Statute.

7.2.5.3 Discussion

7.2.5.3.1 Focus

A TRA focuses on the maturity of a program's "critical" technologies.

1) Identify CTE

All technologies must be evaluated to determine their criticality to the success of the program. These technologies should be identified in the context of the program's systems engineering process, based on a comprehensive review of the most current system performance and technical requirements and design and the program's established technical Work Breakdown Structure (WBS). When competing designs exist, the PM should identify possible technologies separately for each design. Inputs to this process include the list of technologies developed by the PM and specific technical planning performed by existing or previous contractors or Government agencies.

There are two general criteria for determining when a technology should be considered critical.

- 1) Technologies that have not been used in previously fielded systems at all.
- 2) Technologies that have been used in previously fielded systems but where the new, proposed operating environment presents new challenges to their proper operation/function.

Considerations may include related uses of the same or similar technology, number of prototypes/breadboards built and tested, relevance of previous test and operating conditions to the intended operational environment, and results achieved. Critical technologies should not be selected based on routine engineering or integration risk elements, but are items that require more than the normal engineering development (i.e., a specific technology maturation program vice normal design/production development activities.)

Technology risk identification should start well before the formal TRA process. Potential critical technology identification can begin as early as the MSA phase, which precedes MS A. Early

evaluation of technology maturity may help refine the potential critical technologies to be assessed, and may lead to earlier consideration of more mature alternatives.

- 2) Determine the maturity of critical technologies (i.e., whether technologies have been demonstrated in a relevant environment)

The TRA team uses all of the available information to assess critical technologies in order to determine if these technologies have been demonstrated in a relevant environment and if risk has been reduced or can be reduced to an acceptable level for inclusion in an EMD program. The process of collecting and organizing the information, such as component or subsystem test descriptions and environments, should begin as early as possible. Any other analyses and information necessary, including planned demonstration events and tests, to assess the maturity of the technologies should also be identified.

TRLs can serve as a helpful knowledge-based standard and shorthand for evaluating technology maturity, but they must be supplemented with expert professional judgment. More information on TRAs can be found in NAVAIRINST 3910.1.

7.2.5.3.2 Unique Considerations

- The TMRR phase includes a mix of activities intended to reduce the specific risks associated with the product to be developed, such as:
 - Additional design trades and requirements trades
 - Competitive sources conducting technology maturation
 - Risk-reduction activities
 - Preliminary design activities up to and including a PDR prior to source selection for the EMD Phase.
- Risk-reduction prototypes may also be used when they will reduce engineering and manufacturing development risk at an acceptable cost. Risk reduction prototypes can be at the system level or can focus on subsystems or components.
- Multiple technology development demonstrations may be necessary before the operational user and material developer can substantiate that a preferred solution is feasible, affordable, and supportable; satisfies validated capability requirements; and has acceptable technical risk.
- Risk indices resulting from the TRA are rough benchmarks and not necessarily conclusive about the degree of risk mitigation needed prior to development. Deeper analysis of the actual risks associated with the preferred design and any recommended risk mitigation must be conducted and provided to the MDA.
- Even when a TRA is not required, an objective assessment of technology maturity and risk should be a routine aspect of any DoD acquisition. Technology developed in Science and Technology (S&T) efforts or procured from industry or other sources shall have been demonstrated in a relevant environment or, preferably, in an operational environment.

- If technology is not mature, an alternative technology that is already mature and that can meet the user's needs shall be used, if available.
- The program may engage the user in a dialog on appropriately modifying the requirements to avoid using an immature technology.

7.2.5.4 Outcome

The TRA accomplishes the following:

- Identifies technologies deemed to be critical and the selection criteria used.
- Identifies the relevant environment in which each technology was assessed (e.g., normally the operational environment in which the system is intended to perform).
- Assesses the maturity of critical technologies (i.e., whether the assessed technology has been demonstrated in a relevant environment or not, including data, papers, presentations, etc. that support the assessments).
- Identifies planned risk-mitigation activities and demonstrates how those activities will reduce the risk of the technology to acceptable levels.

For MDAPs, the TRA provides mandatory input for the certification decision at MS B in accordance with 10 U.S.C. 2366b. For non-MDAPs, a TRA still provides objective insight into the technical development risk going forward.

7.2.6 Integrated Baseline Review (IBR)

7.2.6.1 Purpose

The IBR should be employed by PMs throughout the life of projects to understand the risks associated with the Performance Measurement Baseline (PMB) the contractor is executing.

7.2.6.2 Timing

The Integrated Baseline Review (IBR) is conducted on all contracts that have a requirement to comply with Earned Value Management (EVM) system guidelines. Typically the IBR is conducted shortly after EMD contract award following down-select at PDR-II. However, the IBR can occur in any Acquisition Milestone/Phase and must be conducted within 180 calendar days after contract award. After the initial IBR, changes to the PMB over the life of the program may warrant an additional IBR. These changes may result from exercise of options and contract modification.

7.2.6.3 Discussion

7.2.6.3.1 Focus

The review ensures that the technical scope of work is fully included in the PMB and is consistent with authorizing documents, including full system focus, in-depth integration, software considerations, and maturation plans. A review of planned resources (budgets, facilities, personnel, skills, etc.) is conducted to ensure that they are available and adequate for the

assigned tasks, and planned tasks are assessed to ensure objective measurement with respect to technical progress.

Key milestones within the project schedule are identified and supporting schedules are assessed to ensure that they reflect a logical flow to accomplish the work. The IBR establishes a mutual understanding of the project's PMB and provides for an agreement on a plan of action to evaluate and manage the inherent PMB risks.

7.2.6.3.2 Unique Considerations

- The RMP provides the basis for iterative assessment at IBR and management of cost, schedule, technical, management, and resource risks.
- The PM is responsible for planning and executing the IBR.
- IBR Team Participants will include:
 - 1) Program management (e.g., PM, AIR-1.1.3 CM Representative or OPR/PMA CM)
 - 2) AIR 4.2
 - 3) Business management
 - 4) Subcontract management
 - 5) Technical management (e.g., systems engineering, software engineering, manufacturing, integration and test engineering, and integrated logistics support)
- IBR participant training is needed to ensure that the IBR team can identify and adequately assess the project risk.

7.2.6.3.3 Entry Criteria

- The PMB should:
 - 1) Be established by the performing organization (Contractor or Government)
 - 2) Should reflect the entire scope of work documented at the appropriate level of detail
- The Program Teams must be familiar with the project scope of work described in the SOW/SOO and understand all management processes, including management of subcontractors.

7.2.6.3 Outcome

Completion of the review should result in the assessment of risk within the PMB and the degree to which the following have been established:

- Technical scope of work is fully included and is consistent with authorizing documents. This should include full system focus, and in-depth integration, and software considerations, and CTE maturation plans.
- Project schedule key milestones, including the critical path, are identified and supporting schedules reflect a logical flow to accomplish the work.
- Resources (budgets, facilities, personnel, skills, etc.) are available and are adequate for the assigned tasks.

- Tasks are planned and can be measured objectively relative to the technical progress.
- Rationales underlying the PMB are reasonable.
- Management processes (e.g., PM, SE, CM, safety, etc.) support successful execution of the project.

IBR POC: For additional information/details on IBRs or EVM, contact AIR-4. 2. 3.

7.2.7 Operational Test Readiness Review (OTRR)

7.2.7.1 Purpose

The OTRR is a multi-disciplined product and process assessment to ensure readiness for Operational Test and Evaluation (OT&E) with a high probability the system will successfully complete operational testing. Successful performance during OT&E indicates the system being tested is effective and suitable for Fleet introduction. The decision to enter production may be based on this determination. **The understanding of available system performance to meet the CDD/CPD is of critical importance to this review.**

7.2.7.2 Timing

The OTRR should be conducted during the Production and Development acquisition phase. Similar to other technical reviews, the OTRR should be event driven and should not be scheduled at a particular number of months after contract award; but rather, should occur relative to the readiness/maturity of the system under test to begin the system-level operational testing. An OTRR Operational Assessment (OA), if performed, would occur during the latter part of EMD.

7.2.7.3 Discussion

7.2.7.3.1 Focus

7.2.7.3.2 Unique Considerations

- The system provided for OT&E, including software, is production representative with differences between the system provided for test and production configuration identified.
- All software is sufficiently mature and stable for fleet introduction, under correct configuration control and documented with appropriate impact analyses.
- There are no outstanding Trouble Reports that:
 - 1) Prevent the accomplishment of an essential capability.
 - 2) Jeopardize safety, security, or other requirements designated critical.
 - 3) Adversely affect the accomplishment of an essential capability and no work-around solution is known.
 - 4) Adversely affect technical, cost, or schedule risks to the project or to life-cycle support of the system, and no work-around solution is known.

- There are no unresolved Priority 1 or 2 software problem reports, and all Priority 3 problems are documented with appropriate impact analyses.
- Operational requirements defined in the CDD/CPD must match the requirements tested to in the TEMP:
 - 1) System requirements and the time phasing of them must be traceable from the CDD/CPD to the SDS, and the TEMP.
 - 2) Spiral Development, if incorporated, must be supported by the CDD/CPD, SEP, and other acquisition-related documentation.
- Threat information (e.g., threat system characteristics and performance, electronic countermeasures, force levels, scenarios, and tactics), to include security classification, required for OT&E is available to satisfy Operational Test Authority (OTA) test planning.
- The system is safe to use as planned in the concept of employment:
 - 1) Any restrictions to safe employment are stated.
 - 2) The ESOH program requirements have been satisfied.
 - 3) The system complies with Navy/Marine Corps environmental, safety, and occupational health/hazardous waste requirements, where applicable.
 - 4) Environmental, safety, and occupational health/hazardous waste reviews and reports have been provided to Commander, Operational Test and Evaluation Force (COMOPTEVFOR) or Director, Marine Corps Operational Test and Evaluation Activity (MCOTEA).
 - 5) When an energetic is employed in the system, Weapon System Explosives Safety Review Board (WSESRB) criteria for conduct of test have been met.
 - 6) No unresolved NAVAIR deficiencies related to Airworthiness remain.
- Interoperability requirements have been demonstrated and approved.

7.2.7.3.3 Entry Criteria

- An approved TEMP
- Accredited M&S
- Cybersecurity and applicable documentation (PPP), and/or security certification and accreditation (C&A) are in place.
- Interoperability capabilities, including ship interfaces, are assured.
- Statement of Functionality for software qualification testing (SQT) that describes the software capability has been provided to COMOPTEVFOR and Chief of Naval Operations (CNO) (code N091). For programs to be tested by MCOTEA, the SQT Statement of Functionality has been provided to Director, MCOTEA, and Marine Corps Tactical Systems Support Activity.

- Software metrics demonstrating maturity/stability are to be provided to the software SME.
- Ensure that agreement between COMOPTEVFOR and the Program regarding systems with high MTBF will not impact resolution of Critical Operational Issues during reliability determination.
- Risks and mitigation steps are identified and being actively managed.
- System operating, maintenance, and training documents are to be provided to the OTA
- System certification accreditation documents, including the System Security Authorization Agreement and the Authority to Operate (ATO) or Interim ATO, have been provided to the OTA.
- Logistics support, including spares, repair parts, and support/ground support equipment is available.
- The OT&E manning of the system is addressed and satisfied.
- Training identified and/or completed prior to testing.
- The system is production or production representative of what will be delivered to the fleet.
- Models, simulators, and targets identified and accredited.
- Approval of spectrum certification compliance and spectrum supportability has been obtained.

7.2.7.4 Outcome

Agreement that the production configuration system can proceed into IOT&E with a high probability of success, based on:

- The system's Developmental Test and Evaluation (DT&E) results.
- The system's progress against critical technical parameters documented in the TEMP.
- Verification that identified technical risks have been retired during developmental testing.
- The assessed impact of performance waivers and deviations.
- Verification of the IOT&E entrance criteria specified in the TEMP.
- A common understanding of available system performance to meet the CPD performance threshold values.

(Note: More than one OTRR may be conducted prior to IOT&E.)

7.2.8 Manufacturing Readiness Assessment (MRA)

7.2.8.1 Purpose

Manufacturing readiness is critical to the successful introduction of new products and technologies to the Warfighter. MRAs are designed to assess the maturity and risk of a given technology, weapon system, or subsystem from a manufacturing perspective and to guide risk mitigation efforts. MRAs are also intended to provide decision makers at all levels with a common understanding of the relative maturity and attendant risks associated with

manufacturing technologies, products, and processes being considered to meet DoD requirements. They provide specific criteria to support decision-making based on the knowledge of manufacturing status and risk. CM assessments, or incremental audits, should be conducted to support or in parallel with MRAs.

7.2.8.2 Timing

If LRIP is required, to the extent practical, this production effort should be performed in a manner that uses designs, tooling, materials, components, facilities, and personnel that are representative of the FRP environment. The FRP decision requires that manufacturing risk is understood and that the manufacturing processes for the system be capable, in control, and affordable. Prior to the FRP decision, an MRA should be conducted to ensure any outstanding risks will not impact the programs ability to deliver FRP requirements.

7.2.8.3 Discussion

7.2.8.3.1 Focus

MRL and assessments of manufacturing readiness have been designed to manage manufacturing risk in acquisition while increasing the ability of the technology development projects to transition new technology to weapon system applications. MRL definitions create a measurement scale and vocabulary for assessing and discussing manufacturing maturity and risk. Using the MRL definitions, an assessment of manufacturing readiness is a structured evaluation of a technology, component, manufacturing process, weapon system or subsystem. It is performed to:

- Define current level of manufacturing maturity.
- Identify maturity shortfalls and associated costs and risks.
- Provide the basis for manufacturing maturation and risk management.

7.2.8.3.2 Unique Considerations

Technical authority for MRAs within NAVAIR resides with AIR-4.1.9. Programs should contact AIR-4.1.9 personnel early in the program planning phase to obtain current contract language and to support the requirements of the formal MRA. MRA concepts have been integrated into the SETR Checklists throughout the entire SETR process by the AIR-4.1.9 competency. However, the completion of a SETR Checklist does not meet the requirements of a formal MRA.

7.2.8.4 Outcome

All Major Defense Acquisition Programs are required to evaluate MRL through a structured Manufacturing Readiness Assessment Process. MRA results will be briefed at PDR, CDR, and PRR reviews for MDAPs. As such, MRA-related questions shall not be tailored from the associated checklists for MDAPs. In order to reduce the risk of transitioning technology from concept to production for all NAVAIR acquisition programs, it is recommended that each program consider the application of MRAs. The maturity of the manufacturing tools/processes is characterized by the use of MRLs, which are defined in the Manufacturing Readiness Level (MRL) Deskbook, Version 2.2.1 October, 2012 found at <http://www.dodmrl.org>.

Appendix A – Request for Action (RFA) Form

REQUEST FOR ACTION CHIT				
R F A I N I T I A T O R	TYPE: <input type="checkbox"/> SRR <input type="checkbox"/> PDR <input type="checkbox"/> OTHER: _____		ASSIGNMENT: <input type="checkbox"/> RFA <input type="checkbox"/> RFI <input type="checkbox"/> Minutes/Action	
	SUBJECT/TITLE: _____		SUBSYSTEM PANEL: _____	
	REQUEST NO: _____			
	REFERENCED DOC: _____			
	SPECIFIC PROBLEM OR CONCERN: _____			
I P T R E S P O N S E	RECOMMENDED ACTION: _____			
	RECOMMENDED CATEGORY: _____		RECOMMENDED URGENCY/DATE: _____	
	INITIATOR'S NAME: _____	IPT: _____	ACTIVITY/CODE/PHONE: _____	DATE: _____
	PROPOSED ACTION: _____			
	PROPOSED SCHEDULE: _____			
E X E C U T I V E S E S S I O N	RECOMMENDED CATEGORY: _____		RECOMMENDED URGENCY/DATE: _____	
	ENGINEER'S NAME: _____		ACTIVITY/DEPT/PHONE: _____	DATE: _____
	EXECUTIVE REVIEW AND DECISION: _____			
	ASSIGNED CATEGORY: _____		ASSIGNED URGENCY/DATE: _____	
	IMPACT: _____			
PROGRAM REPRESENTATIVE: _____		DATE: _____	CONTRACTOR REPRESENTATIVE: _____	DATE: _____
DRB DIRECTOR: _____		DATE: _____		

NAVAIR 4355/4 (1/99) S/N: 0102-LF-980-7400

Figure 5. Sample RFA Form

Appendix B – Checklist Content: Competency Contributors

One of the key constructs of the Menu-Driven SETR Checklists is their focus on NAVAIR Competency ownership of the question content. Table 2 provides a list of the NAVAIR competencies currently represented in the Menu-Driven SETR Checklists.

Table 2. NAVAIR Competencies Represented in Menu-Driven SETR Checklist

1.0PM	Program Manager
1.1.3	Configuration and Data Management
1.6	Environmental Programs
2.0	Contracts
4.0 P	Airworthiness
4.0 TRA	Technology Readiness Assessment (TRA)
4.1.1	System Engineering
4.1.9 E	Critical Item Management
4.1.10	Reliability & Maintainability
4.1.13	E3 Engineering
4.1.14	Anti-Tamper
4.1.16	System of Systems (SoS) Architecture
4.1.18	Mission Engineering & Interoperability
4.2	Cost
4.3	Aircraft & Unmanned Aerial Vehicles
4.4	Propulsion & Power Systems
4.5	Avionics
4.6	Human Systems
4.7	Weapons & Energetics
4.8	Support Equipment & Aircraft Launch & Recovery Equipment (SE/ALRE)
4.9	SW and Mission Systems Integration
4.11	Combat and Information Systems Engineering
4.0 M	Mission Engineering & Analysis
5.0	Test & Evaluation (T&E)
6.7	Logistics Management Integration
6.6	Logistics Management Integration
6.7	Industrial & Logistic Maintenance Planning and Sustainment
6.8	Aviation Readiness & Resource Analysis
7.2	Information Assurance
7.4	Security
7.10	Infrastructure Business Operations Department
11.0	Legal
CTO	Chief Technology Office (CTO)

SETR Competency Reviewer List

As noted previously, the SE should be responsible for providing various outputs of the Menu-Driven SETR Checklists to Competency Reviewers during the SETR process. A current list of the SETR Competency Reviewers can be downloaded from the NSERC page, under CLM Reference Documents section, and clicking on the “SETR Competency Reviewer List” filename.

<https://nserc.nswc.navy.mil/navair/NAVAIRSE/checklist/SitePages/Home.aspx>

At a minimum, the following checklist-generated reports should be provided to the TRB Chair and the POCs on the Competency Reviewer List:

- Final Items Tailored OUT Report (By Competency)
- Final Scoring Roll-Up – By Entry Criteria Detailed Scoring – By Competency
- The Items Tailored OUT report should be submitted to the TRB Chair for formal approval before scoring of the Checklist begins. These reports should also be provided to the Competency Reviewer POCs.
- The Final Scoring Roll-Up and Final Detailed Scoring report should be submitted to the TRB Chair for formal review to assist them in determining if the program is ready to formally conduct the SETR event. These reports should also be provided to the Competency Reviewer POCs.

Appendix C – Acquisition Phase to Architecture Description

The SETR process is executed within the framework of the DON Two Pass, Six Gate Acquisition Process. An overview of that process is depicted in Figure 6. The activities in the upper row occur at the OSD/Joint level. The activities in the middle row occur at the OPNAV/Headquarters Marine Corps (HQMC) level, although the MDA is dependent on the ACAT level. The MDA for ACAT 1 programs is at the OPNAV/HQMC level, but may be at the Systems Command (SYSCOM)/PEO level for ACAT 2 and below. The activities in the bottom row occur at the SYSCOM/PEO/PMA level.

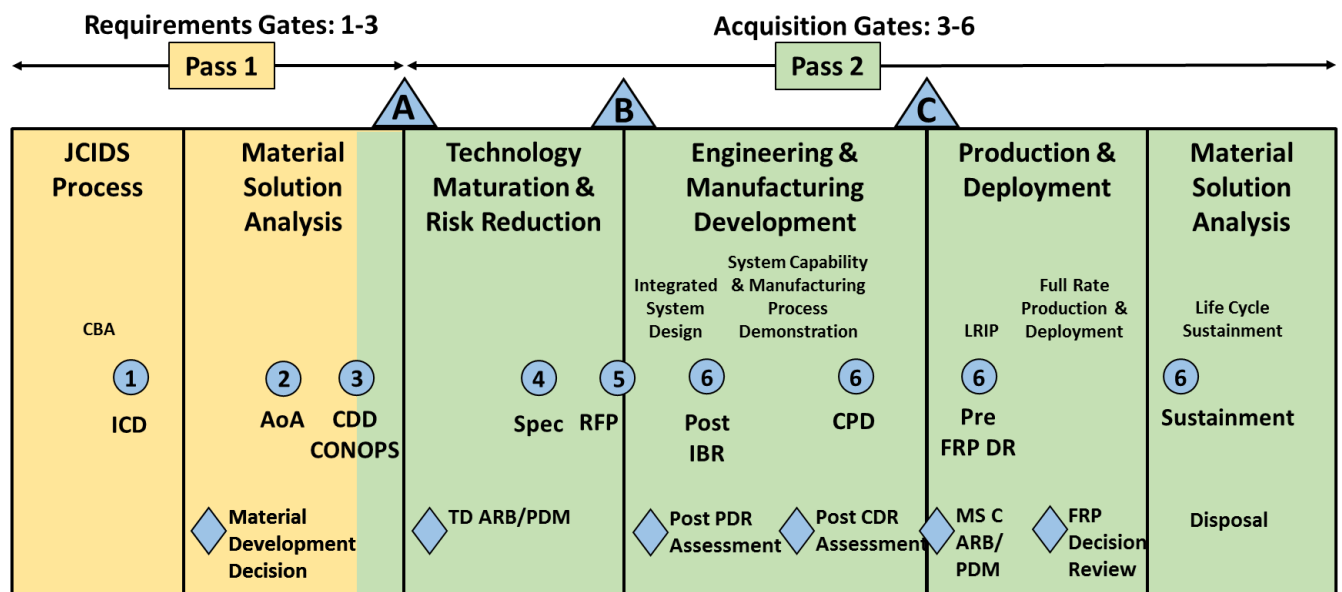


Figure 6. DON Two-Pass, Six Gate Review Process Overview

Table 3 cross references SETR events to the Acquisition Phases in the DON Two Pass, Six Gate Acquisition Process.

Table 3. SETR to Acquisition Phase Cross-Reference

Acquisition Phase	Baseline	Review	Architecture Description
Pre-MS A	Capability Baseline	ITR	<ul style="list-style-type: none"> High-level operational capabilities, usually a grouping of mostly existing capabilities to achieve a new operational capability. Understanding of the big picture, i.e., what the system of interest is intended to do Timeframe to implement capability

Acquisition Phase	Baseline	Review	Architecture Description
	Objective Baseline	ASR	<ul style="list-style-type: none"> • Capture of Operational Context of the system • Model of the trade space to analyze the options being evaluated • Ultimately, the resulting architecture model should be used to support the selected option • Description of the system interdependencies, or how it will interact in the system of systems environment. • The architecture model supports the documentation of the external interface requirements
	Performance Baseline	SRRI	<ul style="list-style-type: none"> • Description of physical and logical interfaces, any constraints and performance parameters on those interfaces, and system requirements tailored to the selected system. • Clearly defined system boundaries, logical and physical. • Typically provided as part of Government Furnished Information (GFI) to facilitate refinement of system and external interface requirements.
MS A	Requirements Baseline	SRRII	<ul style="list-style-type: none"> • The previous architectural products are reviewed with the awarded contractor for clarification and buy-in.
	Functional Baseline	SFR	<ul style="list-style-type: none"> • Identification of major functions within a system in a functional architecture model • Description of internal system logical interfaces, any constraints and performance parameters on those interfaces, and system requirements. • Description of information and functional flow between systems. • Identifies and documents interfaces and system component interdependencies using component, interface and data models within architecture.

Acquisition Phase	Baseline	Review	Architecture Description
	Allocated Baseline	PDR	<ul style="list-style-type: none"> • Description of informational, functional, and physical flow between systems • Continued development of subsystem implementation details • PDR will be prior to MS B unless waived by the MDA
MSB	Product Baseline (initial)	CDR	<ul style="list-style-type: none"> • Detailed representation of the system design for use during production • Provide as reference and to manage change
MSC	Product Baseline (final)	SVR, PRR, OTRR	<ul style="list-style-type: none"> • SVR/FCA confirms all verification requirements have been met and PRR confirms readiness to begin manufacturing – System can enter LRIP. • PCA confirms physical configuration meets design to establish Product Baseline (final) for production. Government establishes CM System and system proceeds IOT&E for final verification and validation. • System can be deployed after IOT&E and enter FRP upon successful FRPDR.

Appendix D – MRLs and TRLs in the SETR Timeline

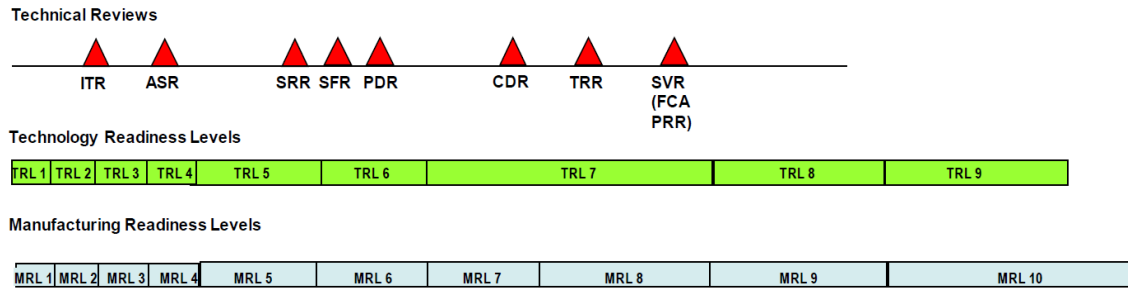


Figure 7. Relationship of MRLs to System Milestones, TRLs, and Technical Reviews

*SSR not shown, required maturity at SSR should be approaching Software TRL-6 vice Hardware TRL-6.

Appendix E – Acronym Definitions

Term	Definition
AAP	Abbreviated Acquisition Program
ACAT	Acquisition Category
AoA	Analysis of Alternatives
APB	Acquisition Program Baseline
APEO(E)	Assistant Program Executive Officer (Engineering)
APEO(L)	Assistant Program Executive Officer (Logistics)
APEO(T&E)	Assistant Program Executive Officer (Test and Evaluation)
APM(T&E)	Assistant Program Manager for Test and Evaluation
APME	Assistant Program Manager For Engineering
APML	Assistant Program Manager for Logistics
APMSE	Assistant Program Manager For Systems Engineering
AS	Acquisition Strategy
ASR	Alternative Systems Review
AT	Anti-Tamper
ATM	Action to Minutes
ATO	Authority To Operate
BOM	Bill of Materials
C&A	Certification and Accreditation
CAD	Computer-Aided Design
CAI	Critical Application Item
CAM	Computer-Aided Manufacturing
CARD	Cost Analysis Requirements Description
CBA	Capabilities Based Assessment
CDD	Capabilities Development Document
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CHENG	Chief Engineer
CI	Configuration Item
CIL	Critical Items List
CIO (IA)	Corporate Information Officer (Information Assurance)
CJCSI	Joint Chiefs of Staff Instruction
CM	Configuration Management
CMA	Configuration Management Assessment
CMP	Configuration Management Plan
CMRS	Calibration Measurement Requirements Summary
CNO	Chief of Naval Operations
COMOPTEVFOR	Commander, Operational Test and Evaluation Force
CONEMP	Concept of Employment
CONOPS	Concept of Operations
COTF	Command Operational Test and Evaluation Force
COTS	Commercial Off-the-Shelf

Term	Definition
CPD	Capability Production Document
CPI	Critical Program Information
CSCI	Computer Software Configuration Item
CSI	Critical Safety Item
CSU	Component Software Unit
CTE	Critical Technology Element
CTO	Chief Technology Office
DBDD	Database Design Document
DCMA	Defense Contract Management Agency
DIACAP	DoD Information Assurance Certification & Accreditation Program
DISR	Defense Information Technology Standards Registry
DM	Data Management
DMSMS	Diminishing Manufacturing Sources and Material Shortages
DoD	Department of Defense
DoDAF	Department of Defense Architecture Framework
DODI	Department of Defense Instruction
DON	Department of the Navy
DOORS	Dynamic Object-Oriented Requirements System
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities
DT	Developmental Testing
DT&E	Developmental Test and Evaluation
DT/OT	Developmental Test/Operational Test
E/DRAP	Engineering/Data Requirements Agreement Package
E3IAR	Electromagnetic Environmental Effects (E3) Integration & Analysis Report
E3VP	Electromagnetic Environmental Effects Verification Procedure
E3VR	Electromagnetic Environmental Effects Verification Report
EAC	Estimate At Completion
EAF	Expeditionary Airfield
ECP	Engineering Change Proposal
EMD	Engineering and Manufacturing Development
EMI	Electromagnetic Interference
ERB	Executive Review Board
ESOH	Environment, Safety and Occupational Health
EV	Earned Value
EVM	Earned Value Management
FAI	First Article Inspection
FCA	Functional Configuration Audit
FCB	Functional Capabilities Board
FD	Full Deployment
FMECA	Failure Modes, Effects, and Criticality Analysis
FOC	Full Operational Capability
FRP	Full Rate Production

Term	Definition
FRPDR	Full Rate Production Decision Review
FRR	Flight Readiness Review
FST	Fleet Support Team
FTA	Fault Tree Analysis
FY	Fiscal Year
FYDP	Future Years Defense Program
GFI	Government Furnished Information
GOTS	Government Off-the-Shelf
HMMP	Hazardous Materials Management Plan
HQMC	Headquarters Marine Corps
HSI	Human Systems Integration
HWCI	Hardware Configuration Item
I&T	Integration and Test
IA	Information Assurance
IAM	Integrated Architecture Model
IAS	Information Assurance Strategy
IAVM	Information Assurance Vulnerability Management
IBR	Integrated Baseline Review
ICD	Initial Capabilities Document
ICD	Interface Control Document
ICEP	Interoperability Certification & Evaluation Plan
ICWG	Interface Control Working Group
IDD	Interface Design Document
IDE	Integrated Data Environment
IETM	Interactive Electronic Technical Manual
ILSMT	Integrated Logistics Support Management Team
IMP	Integrated Maintenance Program
IMS	Integrated Master Schedule
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IP	INTELLECTUAL PROPERTY
IPMR	Integrated Program Management Report
IPRR	Incremental Production Readiness Review
IPT	Integrated Product Team
IRR	Integration Readiness Review
IRS	Interface Requirements Specification
IRT	Independent Review Team
ISEE	Integrated Systems Engineering Environment
ISR	In-Service Review
ISRB	In-Service Review Board
IT	Information Technology
ITR	Initial Technical Review
IUID	Item Unique Identification
JCB	Joint Capabilities Board

Term	Definition
JCD	Joint Capabilities Document
JCIDS	Joint Capabilities and Development System
JROC	Joint Requirements Oversight Council
JSSG	Joint Service Specification Guide
KPP	Key Performance Parameter
KSA	Key System Attribute
LCC	Life Cycle Cost
LCCE	Life Cycle Cost Estimate
LCL	Life Cycle Logistics
LCSP	Life Cycle Sustainment Plan
LFT&E	Live Fire Test and Evaluation
LMI	Logistics Management Information
LORA	Level of Repair Analysis
LRFS	Logistics Requirement and Funding Summary
LRIP	Low Rate Initial Production
LSI	Lead System Integration
LSP	Logistics Support Plan
M&S	Modeling and Simulation
MCOTEA	Marine Corps Operational Test and Evaluation Activity
MCSE	Model-Centric Systems Engineering
MDA	Milestone Decision Authority
MDAP	Major Defense Acquisition Program
MDD	Material Development Decision
MLDT	Mean Logistics Delay Time
MOE	Measure of Effectiveness
MOP	Measure of Performance
MOS	Measure of Suitability
MRA	Manufacturing Readiness Assessment
MRL	Manufacturing Readiness Level
MS	Milestone
MSA	Material Solution Analysis
MTBF	Mean Time Before Failure
NAMDRP	Naval Aviation Maintenance Discrepancy Reporting Program
NAVAIR	Naval Air Systems Command
NAVRIP	Naval Aviation Readiness Integrated Improvement Program
NDA	Non-Disclosure Agreements
NDI	Non-Development Item
NEPA	National Environmental Policy Act
NLT	Not later than
NR-KPP	Net-Ready Key Performance Parameters
NSERC	Naval Systems Engineering Resource Center
NTSP	Navy Training System Plan
O&M,N	Operation and Maintenance, Navy
OA	Operational Assessment

Term	Definition
OAAT	Open Architecture Assessment Tool
OAG	Operational Advisory Group
OEM	Original Equipment Manufacturer
OMS/MP	Operational Mode Summary/Mission Profile
OPEVAL	Operational Evaluation
OPNAV	Operations Navy
OPR	Office of Primary Responsibility
OPSEC	Operational Security
OSD	Office of the Secretary of Defense
OT	Operational Testing
OT&E	Operational Test and Evaluation
OTA	Operational Test Authority
OTRR	Operational Test Readiness Review
OTS	Off-the-Shelf
OV	Operational View
P3I	Pre-Planned Product Improvement
PAO	Public Affairs Office
PAR	Production Assessment Review
PBFR	Platform Base Facilities Requirements
PBL	Performance-Based Logistics
PBS	Performance-Based Specification
PCA	Physical Configuration Audit
PCO	Procuring Contracting Officer
PDR	Preliminary Design Review
PEO	Program Executive Officer
PESHA	Public Employees Safety and Health Act
PESHE	Programmatic Environment Safety, and Occupational Health Evaluation
PHS&T	Packaging, Handling, Storage and Transportation
PM	Program Manager
PMA	Program Manager, Air
PMB	Performance Management Baseline
PMP	Program Management Plan
POA&M	Plan of Action and Milestones
POC	Point of Contact
POM	Program Objectives Memorandum
POR	Program of Record
PPIP	Program Protection Implementation Plan
PPP	Program Protection Plan
PPS	Provisioning Performance Schedule
PPSL	Program Parts Selection List
PRR	Production Readiness Review
QA	Quality Assurance
R&E	Research and Engineering

Term	Definition
R&M	Reliability and Maintainability
RAM-C	Reliability, Availability, Maintainability, and Cost
RBR	Release Backlog Review
RCM	Reliability Centered Maintenance
RFA	Request for Action
RFI	Request for Information
RFID	Radio Frequency Identification
RFP	Request For Proposal
RMF	Risk Management Framework
RMP	Risk Management Plan
ROM	Rough Order of Magnitude
RTM	Requirements Traceability Matrix
RTVM	Requirements Traceability Verification Matrix
SAD	Software Architecture Description
SAMP	Software Acquisition Management Plan
SCG	Security Classification Guide
SDD	Software Design Description
SDD	System Design Documentation
SDP	Software Development Plan
SDS	System Design Specification
SE	Systems Engineer
SE/ALRE	Support Equipment & Aircraft Launch & Recovery Equipment
SEDIC	Systems Engineering Development and Implementation Center
SEMP	Systems Engineering Management Plan
SEP	Systems Engineering Plan
SERD	Support Equipment Requirements Document
SETR	Systems Engineering Technical Review
SFR	System Functional Review
SIDD	Software Interface Design Description
SIL	Systems Integration Laboratory
SIP	Systems Integration Plan
SIRD	Software Interface Requirement Description
SME	Subject Matter Expert
SOO	Statement of Objectives
SOW	Statement of Work
SQA	Software Quality Assurance
SQT	System Qualification Test
SRA	System Requirements Analysis
SRA	Schedule Risk Assessment
SRB	Specification Review Board
SRD	Software Requirements Description
SRR	System Requirements Review
SRS	System Requirements Specification
SS	System Specification

Term	Definition
SSERA	Supportability/Support Equipment Requirements Analysis
SSHA	Sub-System Hazard Analysis
SSMP	System Safety Management Plan
SSPP	System Safety Program Plan
SSR	Software Specification Review
STAR	System Threat Assessment Report
STP	Software Test Plan
SUM	Software User's Manual
SV	System Verification
SVD	Software Version Description
SVR	System Verification Review
SWP	Standard Work Packages
SwRD	Software Requirements Description
SwRS	Software Requirements Specification
SYSCOM	Systems Command
T&E	Test and Evaluation
TACSIT	Tactical Situation
TAE	Technical Area Expert
TCR	TEMPEST Countermeasures Review
TDP	Technical Data Package
TDS	Technology Development Strategy
TEMP	Test and Evaluation Master Plan
TES	Test and Evaluation Strategy
TIM	Technical Interchange Meeting
TMA	Technology Maturity Assessment
TMP	Technology Maturation Plan
TMRR	Technology Maturation and Risk Reduction
TMSA	Technology Maturity Self-Assessment
TOC	Total Ownership Cost
TPM	Technical Performance Measurement
TRA	Technology Readiness Assessment
TRB	Technical Review Board
TRL	Technology Readiness Level
TRR	Test Readiness Review
TSP	Training System Plan
TSRA	Training Systems Requirements Analysis
TWBS	Technical Work Breakdown Structure
ULSS	User Logistics Support Summary
UML	Unified Modeling Language
USD(AT&L)	Under Secretary of Defense (Acquisition, Technology and Logistics)
V&V	Verification and Validation
VDD	Version Description Document
WBS	Work Breakdown Structure
WSESRB	Weapon System Explosives Safety Review Board

Term	Definition
WSI	Weapons Systems Integration
XP	Extreme Programming

Appendix F – Notional List of SETR Artifacts

20 August 2014 NOTIONAL SETR ARTIFACT (BOLD TITLES IN CAPITAL LETTERS ARE STATUTORY) (Bold Titles in Mixed letters are Regulatory) (X indicates that the artifact is reviewed at the SETR)	ACRONYM / ABBREVIATION	Initial Technical Review (ITR)	Alternative Systems Review (ASR)	System Requirements Review (SRR-I)	System Requirements Review (SRR-II)	System Functional Review (SFR)	Software specification review (SSR)	Preliminary Design Review (PDR-I)	Preliminary Design Review (PDR/PDR-II)	Critical Design Review (CDR)	Integration Readiness Review (IRR)	Test Readiness Review (TRR)	Flight Readiness Review (FRR) - aviation programs	Functional Configuration Audit (FCA)	System Verification Review (SVR)	Production Readiness Review (PRR)	Physical Configuration Audit (PCA)	In-Service Review (ISR)
Acceptance Test Procedures		X						X			X	X	X	X	X	X	X	X
ACQUISITION PROGRAM BASELINE (APB)	APB							X	X	X			X	X			X	X
ACQUISITION STRATEGY (AS) [also see Technology Development Strategy (TDS) for SETR events prior to MS A]	AS			X	X	X			X	X	X	X	X	X	X	X	X	X
ANALYSIS OF ALTERNATIVES (AOA)	AOA	X	X															
Anti-Tamper (AT) Plan	AT			X		X	X	X	X	X	X	X	X	X	X	X	X	X
Approved Assignment of Official Nomenclature (DD Form 61 or Confirmation Letter)				X	X	X		X	X	X				X	X	X	X	
Aviation Ship Compatibility Analysis				X	X	X		X	X	X	X		X	X	X	X	X	X
Aviation Ship Compatibility Verification Plan												X						
Bill of Materials (BOM)	BOM									X				X	X	X	X	X
Business Case Analysis						X										X		X
Calibration Measurement Requirements Summary (CMRS)	CMRS					X		X	X	X	X	X	X	X	X	X	X	X
Calibration Standards				X	X	X				X	X			X	X	X	X	X
Capabilities Based Assessment (CBA)	CBA	X																
Capability Development Document (CDD)	CDD			X	X			X	X	X	X					X		
Capability Production Document (CPD)	CPD									X	X			X	X	X	X	X
Certification Plan				X	X		X			X		X	X	X	X	X	X	X
Concept of Employment		X																
Concept of Operations (CONOPS)	CONOPS	X	X	X	X	X	X	X	X	X		X		X	X		X	X
Configuration Item/Subsystem Test Plan [also see Test Team Documentation and TEMP]					X	X		X	X	X		X		X	X	X	X	X
Configuration Management (CM) Plan	CM			X	X	X	X	X	X	X	X			X	X	X	X	X

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Contract Data Requirements List (CDRL)	CDRL			X	X	X				X				X	X	X	X	X
Contract Performance Report (CPR) [replaced by Integrated Program Management Report (IPMR)]	CPR																	
CORE LOGISTICS ANALYSIS DETERMINATION/CORE LOGISTICS AND SUSTAINING WORKLOAD ESTIMATE [formerly CORE LOGISTICS ANALYSIS/Depot Source of Repair Analysis]						X		X	X	X				X	X	X	X	X
Corrosion Prevention Control Plan				X	X			X	X	X				X	X	X	X	X
Cost Analysis Requirements Description (CARD) [or CARD-like Document]	CARD			X	X	X	X	X	X	X	X				X	X		X
Cost Model		X				X				X				X	X		X	
Critical Items List (CIL)	CIL					X								X	X	X	X	X
Critical Program Information (CPI) Assessment	CPI			X	X	X	X				X		X					X
Critical Safety Item (CSI)	CSI												X	X	X	X	X	X
Critical Safety Item (CSI)/Critical Application Item (CAI) Management Plan	CSI/CAI											X	X	X	X	X	X	X
Critical Task Analysis Report - (HSI)				X	X	X	X	X	X	X								
Critical Technology Element (CTE)	CTE			X	X	X	X	X	X	X	X	X						
Critical Technology Element (CTE) Technical Work Breakdown Structure (TWBS)	CTE TWBS								X	X	X	X	X					
CYBERSECURITY STRATEGY [formerly INFORMATION ASSURANCE (IA) STRATEGY]			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Data Management Strategy [see INTELLECTUAL PROPERTY (IP) STRATEGY]																		
Database Design Document (DBDD)	DBDD							X	X	X								X
Defense Contract Management Agency (DCMA) Surveillance Reports/SYSCOM Systems Assessment	DCMA				X	X	X	X	X	X	X	X		X	X	X	X	X
(Defense) DoD Information Assurance	DIACAP																	

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Certification & Accreditation Program (DIACAP) Package [renamed as Risk Management Framework (RMF) for DoD Information Technology (IT)]																		
Depot Source of Repair - see CORE LOGISTICS ANALYSIS DETERMINATION/CORE LOGISTICS AND SUSTAINING WORKLOAD ESTIMATE																		
Design Reference Mission Profile				X	X	X												
Developmental Test/Operational Test (DT/OT) Transition Reports	DT/OT													X	X	X	X	
Diminishing Manufacturing Sources and Material Shortages (DMSMS) Plan	DMSMS			X	X	X		X	X	X				X	X	X	X	X
Display/Controls Analyses and Prototyping - (HSI)			X	X	X	X	X	X	X	X								
Earned Value Management (EVM) Products [see ITR; IBR; EAC; and IPMR (formerly CPR)]	EVM																	
Electromagnetic Environmental Effects (E3) Assessment Factors	E3			X	X													
Electromagnetic Environmental Effects (E3) Integration & Analysis Report (E3IAR)	E3IAR							X	X	X								
Electromagnetic Environmental Effects (E3) Requirements	E3			X	X									X	X			
Electromagnetic Environmental Effects Verification Procedure (E3VP)	E3VP			X	X			X	X	X		X		X	X			
Electromagnetic Environmental Effects Verification Report (E3VR)	E3VR												X	X	X	X		X
Electromagnetic Interference (EMI) Requirements Document	EMI					X							X	X	X	X		X
Engineering Drawings						X				X		X	X	X	X	X	X	X
Estimate at Completion (EAC)	EAC				X	X	X	X	X	X	X	X	X		X	X	X	
Expeditionary Airfield (EAF) Analysis	EAF			X	X	X												
Facilities Management Plan	FMP							X	X	X					X	X		

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Facilities Planning Criteria	FPC					X		X	X	X					X	X		
Facilities Requirements Document/Platform Base Facilities Requirements (PBFR)	FRD/ PBFR							X	X	X	X	X			X	X		
Facilities Risk Management Plan [combined with Risk Management Plan]																		
Failure Mode Effects & Criticality Analysis (FMECA)	FMECA							X	X	X	X				X	X		X
Fault Tree Analysis (FTA)	FTA										X			X	X			
Final Core Determination										X								
FREQUENCY ALLOCATION APPLICATION (DD Form 1494) [also see Spectrum Supportability Risk Assessment]	RFID							X	X									
Hazard Analysis [see System Hazard Analysis]																		
Hazardous Materials Management Plan (HMMP)	HMMP								X					X	X	X		X
Human Engineering Design Approach Document- Operator/Maintainer						X	X	X	X	X								
Human Engineering Program Plan	HEPP			X	X	X		X	X	X								
Human Engineering Simulation Concept				X	X	X		X	X	X								
Human Engineering Systems Analysis Report (Top-down Functional Analysis)	HESAR			X	X	X		X	X	X								
Human Engineering Test Plan								X	X	X	X	X						
Human Systems Integration (HSI) Plan(s)	HSI		X	X	X	X		X	X	X		X			X			
Human Systems Integration Report				X	X	X		X	X	X		X	X	X	X	X	X	
INDUSTRIAL BASE CAPABILITIES SURVEY (Should be part of AS)				X		X												
Information Assurance Strategy [SEE CYBERSECURITY STRATEGY]																		
Information Assurance Vulnerability Management (IAVM) Plan	IAVM							X	X	X	X				X	X		X
Information Support Plan (contains Net-	ISP			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Centric Data Strategy)																		
Initial Capabilities Document (ICD)	ICD	X	X															
Initial Threat Environmental Assessment [also see System Threat Assessment Report (STAR)]				X														
Integrated Architecture Model (IAM)/ DoD Architecture Framework (DoDAF)	IAM /DoDAF	X	X	X	X	X	X	X	X	X	X	X	X					
Integrated Architecture Model - 1 Requirements Analysis Viewpoints (OV-1/OV- 2/OV-4/OV-5, Draft OV-3)	OV-			X	X	X		X	X	X	X							
Integrated Architecture Model - 2 Functional Analysis Viewpoints (OV-3, OV-6c, SV-1, SV- 4, SV-5)	OV-, SV-			X		X		X	X	X	X					X		
Integrated Architecture Model - 3 Allocation Baseline Viewpoints (OV-7/SV-2/SV-6/ -10c - 11/TV-1/TV-2)	OV-, SV- , TV-							X	X	X	X							
Integrated Baseline Review (IBR) Assessment	IBR			X	X	X	X	X	X	X	X	X			X	X		
Integrated Master Schedule (IMS)	IMS	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Integrated Program Management Report (IPMR) [formerly Contract Performance Report (CPR)]	IPMR				X	X	X	X	X	X	X	X		X	X	X	X	
INTELLECTUAL PROPERTY (IP) STRATEGY [formerly Data Management Strategy]				X	X	X	X	X	X	X				X	X	X	X	X
Interactive Electronic Technical Manual (IETM)						X								X	X		X	X
Interface Control Document/Interface Design Documentation (IDD)	IDD			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Interface Requirements Specification (IRS)	IRS						X			X	X							
Interoperability Certification & Evaluation Plan (ICEP)	ICEP			X	X	X	X	X	X	X	X	X	X		X	X		
Inter-Program/Platform Information Control Agreement				X	X	X		X	X	X								

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Item Unique Identification (IUID) Implementation Plan	IUID			X	X	X		X	X	X					X	X	X	X
Level of Repair Analysis (LORA)	LORA									X				X	X	X	X	X
Life Cycle Cost Estimate (LCCE)/Total Ownership Cost (TOC)	LCCE/TOC			X	X	X	X	X	X	X	X				X	X		X
Life Cycle Mission Data Plan [formerly Life Cycle Signature Support Plan]								X	X	X			X					
Life Cycle Sustainment Plan (LCSP)	LCSP			X	X	X	X	X	X	X	X	X		X	X	X	X	X
LIVE FIRE TEST AND EVALUATION (LFT&E) Strategy (Report)	LFT&E													X	X	X		X
LOGISTICS ANALYSIS [see CORE LOGISTICS ANALYSIS DETERMINATION /CORE LOGISTICS AND SUSTAINING WORKLOAD ESTIMATE]																		
Logistics Management Information (LMI)- Maintenance Task Plan	LMI			X	X	X		X	X	X		X	X	X	X	X	X	X
Logistics Requirement and Funding Summary (LRFS)	LRFS			X	X	X		X	X	X	X	X			X	X	X	X
Maintenance Plans								X	X	X				X	X	X	X	X
MANPOWER ESTIMATE				X	X	X		X	X	X		X						X
Manufacturing and Quality Competency Analysis of Production Capability								X	X	X	X			X	X	X	X	
Manufacturing Plan				X				X	X	X		X		X	X	X	X	
Mass Properties Control and Management Report				X	X	X		X	X	X			X					
Mission Profile Definition Report				X	X	X	X	X	X	X				X	X			
Modeling and Simulation (M&S) Accreditation Plan	M&S			X		X		X	X	X	X					X		
Modeling and Simulation (M&S) Plan	M&S	X		X	X	X		X	X	X	X	X	X	X	X	X		
Modeling and Simulation (M&S) Report	M&S											X	X	X	X		X	
Modeling and Simulation (M&S) Support Plan	M&S							X	X	X		X	X	X	X	X		X

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Naval Mission Areas (decomposed from Joint Mission Areas)		X																
Navy Training System Plan (NTSP)	NTSP							X	X	X		X	X		X			X
Net Centric Data Strategy [see Information Support Plan]																		
Net-Ready Key Performance Parameters (NR-KPP)	NK-KPP				X	X								X	X			
Offboard Vehicle to Host Platform Compatibility Analysis									X									
Open Architecture Assessment Tool (OAAT)	OAAT			X	X	X					X							
Open Architecture Management Plan				X	X	X		X	X	X					X	X		X
Operational Mode Summary/Mission Profile (OMS/MP)				X	X	X												
Operational Reports																		X
Operations Security (OPSEC) Plan	OPSEC			X		X	X	X	X	X	X	X		X	X	X		X
Packaging, Handling, Storage and Transportation (PHS&T) Documentation	PHS&T					X				X		X		X	X	X	X	X
Parts Management Plan				X	X			X	X	X				X	X	X	X	X
Parts Reliability Program Plan										X				X	X		X	
Plan of Action and Milestones (POA&M) for National Environmental Policy Act (NEPA)/EO12114 Compliance [see PROGRAMMATIC ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH EVALUATION (PESHE)]																		
Procurement Policy and Organization															X	X	X	X
Product Support Strategy (Plan)				X										X	X	X	X	X
Program Budget				X	X	X		X	X	X					X	X		X
Program Protection Implementation Plan (PPIP)	PPIP			X		X	X	X	X	X								
Program Protection Plan (PPP)	PPP		X	X	X	X	X	X	X	X			X	X	X			X

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Program Risk Report				X	X	X	X	X	X	X		X	X	X	X	X	X	X
Program Work Breakdown Structure (WBS)	WBS			X	X	X	X	X	X	X			X					
PROGRAMMATIC ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH EVALUATION (PESHE) and NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) /EXECUTIVE ORDER (E.O.) 12114 COMPLIANCE SCHEDULE	PESHE NEPA E.O.			X	X	X		X	X	X		X	X	X	X	X		
Project/Program Plan						X												X
Prototype Plan				X	X													
Provisioning Performance Schedule (PPS)	PPS									X				X	X		X	X
Quality Assurance (QA) Program (Surveillance) Plan	QA						X	X	X					X	X	X	X	X
Radio Frequency Identification (RFID) Program Plan	RFID							X	X									
Reliability and Maintainability (R&M) Block Diagrams and Math Models	R&M							X	X	X								
Reliability, Availability, Maintainability, and Cost Rationale (RAM-C) Report (Should be attached or linked to the SEP)	RAM-C			X	X			X	X	X	X	X		X	X	X	X	X
Reliability Centered Maintenance (RCM) Analysis	RCM									X				X	X		X	X
Reliability, Maintainability and Diagnostics Allocation Report								X	X					X	X	X	X	X
Reliability, Maintainability and Diagnostics Prediction									X	X					X			X
Reliability, Maintainability and Integrated Diagnostics Program Plan				X	X					X		X			X	X		X
Request for Proposal (RFP)	RFP			X	X	X												
Requirements Traceability Matrix/Product (RTM)	RTM			X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Requirements Traceability Verification	RTVM			X	X	X	X	X	X	X	X	X	X	X	X	X	X	

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Matrix (RTVM)																		
Risk Management Framework (RMF) for DoD Information Technology (IT) [formerly DoD Information Assurance Certification & Accreditation Program (DIACAP)]	RMF									X				X	X			
Risk Management Plan		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Schedule Risk Assessment (SRA)	SRA			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Security Classification Guide						X	X	X	X	X	X		X		X	X		X
Software Acquisition Management Plan (SAMP)	SAMP			X	X	X												
Software Architecture Description (SAD)	SAD						X	X	X	X	X			X	X		X	
Software Build Plan								X	X									
Software Component Software Unit (CSU) Test Plan(s)	CSU TP						X	X	X									
Software Design Description (SDD)	SDD						X	X	X	X	X			X	X	X		X
Software Development Plan (SDP)	SDP			X	X	X	X	X	X	X				X	X	X	X	X
Software Development Strategy				X	X	X												
Software Integration Plan							X	X	X	X	X	X						
Software Interface Design Description (SIDD)	SIDD				X		X	X	X	X	X	X		X	X	X	X	X
Software Maintenance Plan				X										X	X	X	X	X
Software Measures				X	X	X	X	X	X	X	X	X		X	X	X	X	X
Software Product Baseline												X		X	X		X	
Software Quality Assurance (SQA) Findings	SQA					X	X	X	X	X								
Software Quality Assurance (SQA) Plan	SQA				X	X	X	X	X	X				X	X	X	X	X
Software Requirements Description (SRD or SwRD)	SRD or SwRD						X	X	X	X	X			X	X		X	
Software Requirements Specification (SwRS)	SRS						X								X	X		X
Software Requirements Traceability Matrix							X	X	X	X				X	X		X	
Software Safety Program Plan							X											

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Software Security Plan				X						X		X	X		X	X		X
Software Size/Cost Estimate					X	X	X	X	X	X	X			X	X	X	X	X
Software Test Plan (STP)	STP						X	X	X	X		X	X		X	X		X
Software Test Report(s)	STR										X		X	X	X	X	X	X
Software Transition Plan															X	X		
Software Unit and Computer Software Configuration Items (CSCI) Level Test Procedures	CSCI							X	X	X			X	X	X	X		X
Software User's Manual (SUM)	SUM											X						
Software Version Description (SVD) [previously Version Description Document (VDD)]	SVD											X		X	X		X	
Spectrum Sensitivity Test Report										X				X	X			
Spectrum Supportability Risk Assessment [also see FREQUENCY ALLOCATION APPLICATION (DD FORM 1494)]								X	X	X			X	X	X	X	X	
Staffing Plan				X	X	X	X			X	X							
Statement of Work (SOW) and/or Statement of Objectives (SOO)	SOW / SOO			X	X	X				X								
Structural Analysis Report										X		X		X	X	X	X	
Structural Methodology Report										X								
Sub-System and Configuration Item Testability and Fault Tree Analyses (FTAs)	FTA								X	X				X	X	X		X
Sub-System Design Description and Analysis Report						X		X	X	X		X	X	X	X	X	X	X
Sub-System Design Documentation								X	X	X	X	X	X	X	X	X	X	
Sub-System Hazard Analysis (SSHA)	SSHA									X	X			X	X		X	
Sub-System Specification Documentation								X	X	X				X	X	X	X	
Support Equipment Design Documents				X	X	X		X	X	X	X			X	X	X	X	X

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Support Equipment Maintenance Plan								X	X					X			X	X
Support Equipment Management Plan						X		X	X	X	X							
Support Equipment Requirements Document (or Recommendation Data) (SERD)	SERD			X	X			X	X	X				X	X	X		X
Support Equipment Test and Evaluation Strategy (TES) [see TEMP]	TES																	
Supportability Analysis Trade Study				X	X			X	X	X								
Supportability/Support Equipment Requirements Analysis (SSERA).	SSERA			X	X	X		X	X	X		X			X	X		X
Susceptibility, Vulnerability and Integrated System-Level Survivability Analysis				X				X	X	X		X		X	X	X	X	X
System Design Documentation (SDD)	SDD							X	X	X	X	X		X	X	X	X	X
System Design Specification (SDS)	SDS			X	X	X		X	X	X	X	X		X	X	X	X	X
System Hazard Analysis				X	X	X		X	X	X	X	X		X	X	X	X	X
System Integration Plan (SIP)	SIP										X							
System Safety Management Plan (SSMP)	SSMP							X	X	X	X				X	X		X
System Safety Program Plan (SSPP)	SSPP			X	X			X	X	X	X	X		X	X	X	X	X
System Security Engineering Plan				X	X					X					X	X		X
System Specification (SS)	SS				X			X	X	X				X	X	X	X	X
System Test Plans										X	X	X	X	X	X	X	X	X
System Test Report(s)											X	X	X	X	X	X	X	X
System Threat / Security Environment		X																X
System Threat Assessment [replaced by Initial Threat Environment Assessment and STAR]																		
System Threat Assessment Report (STAR) [also see Initial Threat Environment Assessment]	STAR		X	X	X			X	X	X					X	X		X
Systems Engineering (SE) Analysis	SE			X	X			X	X	X	X	X		X	X	X	X	X
Systems Engineering Management Plan (SEMP)	SEMP				X	X	X	X	X	X	X	X	X	X	X	X	X	X

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Systems Engineering Plan (SEP)	SEP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Systems Integration Lab (SIL) Design Report	SIL									X	X							
Systems Integration Lab (SIL) Resource Plan	SIL												X					
Systems Integration Lab (SIL) Test Report	SIL													X	X	X	X	X
Technology Development Strategy (TDS) [see ACQUISITION STRATEGY (AS)]	TDS																	
Technology Maturation and Risk Reduction (TMRR) Phase Plan [formerly Technology Development Phase Plan]	TMMR		X															
Technology Maturation Plan (TMP)	TMP			X	X	X	X	X	X	X	X	X	X	X	X			
Technology Maturity Assessment (TMA)	TMA		X	X	X	X	X	X										
Technology Maturity Self-Assessment (TMSA)	TMSA	X	X	X	X	X	X	X	X									
TECHNOLOGY READINESS ASSESSMENT (TRA)	TRA								X	X	X	X	X					
TEMPEST Control Plan						X		X	X	X						X	X	
TEMPEST Countermeasures Review (TCR) Letter	TCR									X				X	X			
TEMPEST Requirements Questionnaire										X								
Test and Evaluation Master Plan (TEMP)	TEMP		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Test & Evaluation Strategy [replaced by TEMP]																		
Test Data Collection and Dissemination Plan				X	X	X		X	X	X		X	X	X	X	X	X	
Test Team Documentation				X	X	X	X	X	X	X			X	X	X	X	X	
Test Team Structure Documentation										X	X	X			X	X		
Testability Allocation Analysis				X	X			X	X	X								
Trade-Off Studies/Analysis								X	X	X					X	X	X	
Training System Plan (TSP)	TSP			X		X	X	X	X	X	X	X	X	X	X	X	X	X
Training Systems Requirements Analysis (TSRA)	TSRA							X	X	X		X		X	X	X	X	X
User Interface Design Description - (HSI)								X	X	X		X	X	X	X			

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User Logistics Support Summary (ULSS)	ULSS					X		X	X									
Weapon Safety Analysis								X	X	X		X		X	X		X	